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## EDITORIAL NOTES

### GAS PROBLEMS IN WARTIME

SINCE the beginning of the intense aerial bombardment of Great Britain in the middle of August last, gas undertakings have had several severe problems to face, and we think that undertakings in the Greater London area have not had the smallest and the fewest difficulties to encounter. The Prime Minister said in the House of Commons just a week ago that up to that time 14,000 civilians had been killed and 20,000 seriously wounded as the result of attack by air. London has accounted for nearly four-fifths of these casualties. Yet, went on Mr. Churchill, " none of the services upon which the life of our great cities depends—water, fuel, electricity, gas, sewerage —not one has broken down. On the contrary, although there must inevitably be local shortages, all the authorities concerned with the vital functions of a modern community feel that they are on top of their job, and are feeling it increasingly as each week is passed." The Gas Industry does play its part in the " vital functions of a modern community," and in spite of many distressing and disturbing happenings it is, we are certain, on top of its job—much more so, perhaps, than the man in the street or the man in the shelter realizes.

We have already had occasion to comment on the preparations made over a long period by gas undertakings throughout the country for ensuring as far as possible continuity of gas manufacture in the event of enemy bombing finding its target on gas-works and in rendering their distribution systems flexible under severe damage, or safe as possible in the event of fractured mains and services, and also quickly remediable. It is, of course, common knowledge that events of the nature have in some places occurred. We would once again pay tribute to the smoothness, efficiency and coolness with which the various squads of Gas Industry A.R.P. personnel carry on with repair jobs under the most difficult and harassing conditions. We would, too, enjoin the general public to have patience if on occasion there is a fall-off in the pressure of their gas or even, worse still, a temporary cessation of supply. They can be assured that what it is possible to do is being done in their interests, that no gas undertaking is " sleeping-in "—were that possible these nights—on the work of restoring both normal pressure and normal supply.

The Gas Industry is working hard, very hard—and in common with every other public utility—to maintain " business as usual," though in some instances the outcome of the work does not for the time being, and cannot, quite attain this encouraging ideal. We should like for a moment, and from the internal aspect of the Industry, to ask why this is so and consider, too, in the light of experience gained during the past few months the problems which have had to be and will have to be met, and the steps seemingly most likely to smooth-out disturbances and render maximum continuity of gas supply in the best national interest.

First let us consider this important matter of reduction in pressure due to "enemy action "—maybe damage to gas-works; maybe the fracturing of important gas mains. Now it is also common knowledge that town gas supplies the heat requirements (they are not small and they are increasing) of vital factories engaged in the production of war material. It is up to the Gas Industry to take all the steps within its power—and with thought and rapid action much can be done—to make certain that production is not interrupted. There is, we think, a general impression that it is essential for industrial appliances and furnaces supplied by gas to have a pressure of 2½ in. to 3 in. W.G. From experiments and experience we know that it has been found that a pressure as low as 5-tenths W.G. can be employed in a host of processes of the nature envisaged. Of course, the appliances must be adjusted for such a low pressure, which may well obtain after bombing attack for some little while. Where such adjustment is not made—and the task is not a difficult one—it may and probably does mean that a considerable number of appliances engaged on vital war work are temporarily out of action. That is one of the enemy's aims ; it is the Gas Industry's task to frustrate it—and, as we have said, it can frustrate it. In some cases the resistance offered by the supply pipes in factories may necessitate the use of a booster. This again, however, is not a difficult matter. Gas undertakings which have not yet suffered damage to their works plant or distribution system, or both, should consider the likely problems to be met with and make themselves acquainted with the easiest, speediest, and most effective remedial measures. It is not for us to detail them here, for one reason which at least will be obvious.

A more serious problem is actual interruption of gas supply. It may be for a day ; it may be for longer. Should, in the light of experience, gas undertakings recommend firms and factories to install alternative heating agents to cope with temporary interruptions ? An alternative fuel as stand-by to town gas—coke, oil, producer gas, petrol air-gas ? A bitter pill, perhaps; but to our mind the Gas Industry has everything to gain in good-will and natural service in helping to its utmost, and with its very special knowledge, to ensure the consumer not merely continuity of town gas supply, but continuity of the production of materials needed for the efficient prosecution of the war. Industrialists and the public generally would, we think, be even more sympathetic with and tolerant to the Industry did they appreciate that temporary interruption of gas supply was due not to a simple fracture of a main but to the flooding of fractured mains by water from adjacent water mains, and the clearing of the gas mains of water under conditions the reverse of comfortable. But we would conclude this note by saying once again how anxious gas undertakings are to maintain normal supply and much work they are putting in to carry out this object ; and by emphasizing that all should be prepared for the future.

### TRANSFER OF APPLIANCES

THERE has been discussion of late on the subject of the transfer of gas appliances. We feel that annoyance is caused to consumers moving from one area to another if the two gas undertakings concerned are unable to co-operate over the transfer of appliances on hire purchase. It may be recalled that the B.C.G.A. Service Folders of May and June of this year gave a list of some 500 undertakings which are prepared to negotiate with others on a reciprocal basis in the matter of transfer of

appliances. Some undertakings, of course, have been carrying out the plan for many years. There are doubtless certain cases which present difficulty. We realize that undertakings cannot accept transfers indiscriminately, especially under wartime conditions, and we appreciate, too, the difficulties of framing at this juncture any general policy covering all transfers of appliances. At the same time we are in no two minds as to the need, in general, for such a policy. It is surely a first-rate service to the consumer. It cannot do other than help to create and foster goodwill if a consumer knows that no matter where he moves he can be assured of not having to sacrifice an appliance for which he has partly paid.

It has been argued that if the hire purchaser of, say, a piece of furniture moves from one district to another his agreement is not transferred to the new district. We think, however, that there is a difference, and a big difference, between the sale of a gas appliance and, let us say, an easy chair. Sale of the former implies the commencement of a service. Sale of the latter ends the transaction—apart from the collection of hire purchase instalments on due dates. Without transfer of agreement the consumer who has moved his cooker from one area to another has to deal with two gas undertakings. One, the undertaking from which he purchased the appliance ; the other, the undertaking which supplies his cooker with gas. It may be that, in part at any rate, he counts on savings through his prepayment meter to offset hire purchase charges ; and one may well ask whether it is incumbent on the second undertaking to set the prepayment meter accordingly. Suppose, for some reason, the consumer cannot fulfil his contract. Has the first undertaking to arrange to collect the appliance at a distance of, it may be, hundreds of miles ?

We have a letter from a correspondent who points out, quite rightly, that at the present time an important factor which makes it difficult for a consumer to complete the purchase of apparatus is the very heavy cost of moving furniture from one district to another. Removal contractors do not perform this service on a hire-purchase basis. The result is that in many instances consumers are unable to complete the purchase, even if willing to do so. In the event of its not being possible to transfer the balance to another undertaking it is necessary to decide whether to cancel the agreement and remove the appliance, or whether the consumer's record is such that there can be no reasonable doubt that instalments will be duly paid in another part of the country. We are willing to admit that the scheme is one in which the human factor can play an important part in the successful completion of a transfer. But, whatever may be said against the scheme, few, we think, would deny that the pursuit of ideal conditions of service to consumers is the most important purpose for which our Industry exists.

## Personal

Mr. J. ROBB has been appointed Engineer, Manager, and Secretary to the Lichfield Gas Company. Mr. Robb was formerly Manager and Secretary of the Chepstow Gas Company and the Caldicot Gas Company, Ltd.

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Mr. and Mrs. R. B. HODGSON, of Linden Avenue, Darlington, are to-day celebrating the 50th anniversary of their wedding. They were married at Workington on Nov. 13, 1890. Mr. Hodgson will be remembered as sometime Director and General Manager of Ashmore, Benson, Pease & Co., Ltd., of Stockton-on-Tees, and later as Managing Director of the Whessoe Foundry and Engineering Co., Ltd., of Darlington, which position he resigned a few years ago. He was Chairman of the S.B.G.I. in 1927–28, and is at present a member of the Institution of Mechanical Engineers and also of The Institution of Gas Engineers. He is a Director of two engineering works, both employed in the manufacture of gas plant.

## Forthcoming Engagements

Nov.

**18.—London and Counties Coke Association.**—Finance Committee, 12 noon ; Executive Committee, 2 p.m. ; Central Committee, 3 p.m. ; at Gas Industry House.

**19.—I.G.E.**—Arthur Duckham Memorial Fund Committee, 12 noon ; Gas Research Board, 2 p.m.

## The Industry in Yorkshire

### Presentation to Mr. C. S. Shapley

SUBSEQUENT to the last meeting of the Yorkshire Commercial Section held in Leeds on Nov. 5, a presentation was made to Mr. C. S. SHAPLEY, Engineer and General Manager of Leeds City Gas Department, to mark his 21 years' service to the Gas Industry in Yorkshire. Mr. Shapley has been a loyal and devoted member of the Commercial Section throughout the period, and has rendered help in furthering its objects which has been vastly appreciated by its members, who in many other directions have found him ever ready to promote the interests of the Industry as a whole. The large attendance included (by invitation) Mr. Charles Wood (formerly of Bradford City Gas Department), his successor, Mr. E. J. Sutcliffe, Mr. W. B. McLusky (formerly of Halifax Gas Department). Other retired members of the Section who wished to be associated with the presentation were Messrs. R. Watson (Doncaster), F. D. Richmond (Heckmondwike), and A. E. Mottram (Ossett). Mr. G. E. Currier (Bradford) presided.

Called upon to make the presentation, Mr. Arthur L. Jennings (Spenborough) said not only had Mr. Shapley been unsparing in service to the County, but also nationally. He had held the highest office his professional colleagues could confer—President of The Institution of Gas Engineers (1929–30). He was also President in two successive years of the Manchester Association, and President or member of various other organizations. Those who had been privileged to see the various branches of the Leeds Gas Department from time to time could say they bore the stamp of high organizing ability and extreme efficiency. On this occasion they met more particularly to acknowledge Mr. Shapley's outstanding service to the Yorkshire branches of the industry's activities.

The Chairman (Mr. Currier) added his tribute, as did many others. First Chairman on the Section's formation in 1900, Mr. Charles Wood recounted some of the difficulties then arising from pre-existing lack of co-ordination. Yorkshire was the second area to form a Commercial Section, Lancashire having been the first. The movement then spread to the South and, later, to the North. As an assiduous Secretary for many years, Mr. J. E. Lister Cooper (Yeadon) contributed remarks appropriate to the occasion, and the first Secretary, Mr. J. H. Brearley, had something to say on the early days and the ever-growing questions which had since arisen, and put increasing demands on the time and energies of officials and committees, and particularly the present Secretary, Mr. Charles Bateman.

In handing a silver salver to Mr. Shapley, Mr. Jennings said : We are glad to think that this is not connected with retirement, and cherish the hope that your presence with us and the services you have so generously extended to us in the past will be continued for many years to come. As tangible proof of our esteem and regard, every member of our various bodies in Yorkshire has been only too pleased to contribute, as others also who have retired from the profession." Mr. Shapley appropriately responded. It had always been his aim, he said, to serve faithfully the Industry to which they were all dedicated, and he hoped that would long continue.

On the salver were the engraved autograph signatures of the 64 subscribers, and the following inscription :

> " Presented to Charles Stuart Shapley by his friends in Yorkshire as a token of their esteem after twenty-one years' conspicuous service to the Gas Industry in the County."

## A Message from the A.G.A.

### President's Reply to S.B.G.I.

On Sept. 11 Sir Francis Joseph, President of the Society of British Gas Industries, sent a letter to the President of the American Gas Association, Mr. Walter C. Beckjord, in reply to an invitation to attend the Annual Convention of the A.G.A. We published this in our issue of Sept. 18, and the following is Mr. Beckjord's reply :

" I have your letter of the seventeenth in response to our invitation to attend the twenty-second Annual Convention of the American Gas Association, Oct. 7 to 10, and I readily appreciate it would be utterly impossible for you to attend.

" Your letter is very heartening and reflects the splendid courage of your Government and the nation in this terrible struggle now going on. It is a very clear-cut letter and a magnificent statement of your position, and I feel it reflects the sentiment of the entire nation. The things that are being done to-day under the guise of war are unspeakable, and you may be sure the sentiment of the people of this country is united behind the British Empire. Life would not be worth living under conditions that exist in Germany to-day.

" My parents were born in Norway and I was born in Minnesota, but still have relatives over there. I have been trying for several months past to get in touch with them since the German invasion, and only succeeded in hearing from them a few weeks ago. The letter was written several months ago and obviously under censorship, but we were glad to learn they are alive and well, although every one is suffering severe restrictions, which I suppose will be worse from now on.

" May I, in closing, extend the heartiest greetings of the American Gas Association, and our profound wish that everything will come out right in the end, as I am sure it will. We are very proud of the efforts your Gas Industry is making in national defence, and we know you will be there at all times when the call comes."

## NEWS OF THE WEEK.

**Towards Manchester's War Weapons Week** the firm of West's Gas Improvement Co., Ltd., has subscribed the sum of £20,000.

**Cockermouth Urban Council** has decided to raise the price of gas to 3s. 3d. per 1,000 cu.ft., in view of the higher costs of materials.

**Gas Lighting Units** to the number of some 2,500 have been fitted in Blackpool since the decision was made to adopt modified street lighting.

**Now that Modified Street Lighting** in Blackpool has been extended 2,300 gas fittings out of a total of 4,500 to be fixed during the course of this winter have been installed.

**One Thousand Gas Lamps** are to be added to the St. Helens lighting scheme, which is to include all secondary roads. Eccleston, supplied by St. Helens, is also to install modified gas street lighting.

**Paisley Corporation Gas** and Electricity Departments have planned a food week beginning on Nov. 18. Demonstrations are to be given on the various methods of cooking unrationed foods.

**Thurmaston (Leics.) Council,** at their October meeting, decided after a long and, at times, heated discussion, to instal emergency street lighting in certain streets for the winter months. The work is to start at once.

**As a temporary Expedient** the office of Messrs. Robert Dempster & Sons, Ltd., is being operated mainly from 25, Pondcroft Road, Knebworth, Herts. Telephone No. 3293.

The firm's office at 16, Queen Anne's Gate will, as far as possible, remain available for interviews, &c., by appointment.

**The Burnley Branch** of the Women's Gas Council held a successful whist drive recently in the Gas Showrooms. The M.C. was Mrs. A. F. Ames, wife of the Gas Engineer, and refreshments were provided by the committee and officials of the Branch. The proceeds were in aid of Christmas parcels for the troops.

**Street Lighting** in Nelson is to be extended and some 540 gas lamps are to be fixed. The Street Lighting Committee have this week approved a scheme for the extension of a modified lighting system. The Borough Surveyor has been instructed to proceed with the provision of suitable lighting equipment.

A **Noticeable Improvement** in gas sales to domestic consumers—both in the aggregate and in consumption per consumer—is revealed in the report of the Thornton Cleveleys Urban District Council Gas Department. It is observed that forward sales policies adopted during the last two or three years are bearing fruit.

**Several Northern Gas Departments** have arranged to give extra days off to their employees to compensate for war strain. Some are giving two extra days off a fortnight, and some three days. The view is held that it is in the national interest to maintain the health and output of the staff at the highest possible standard.

**Particulars of the Associate-Membership Examination** of the Institution of Chemical Engineers for 1941, with application forms and a memorandum on "The Training of a Chemical Engineer," are now obtainable from the Hon. Registrar of the Institution, 56, Victoria Street, S.W. 1. Application forms are returnable up to Dec. 16.

**Burnley, Colne, and Nelson Joint Transport Board** is to continue experiments with gas driven motor-buses. Seven more single-deck buses operating on the Nelson-Reedley Hallows route upon which the experimental bus has been running are to be equipped. It is not considered practicable to convert double-deck buses.

**Building of a New Gas-Works** near Leningrad has been begun, according to *Izvestia*. It will be one of the largest gas-works in the Soviet Union, supplying gas for the domestic needs of a quarter of the city's residential districts. An industrial settlement to house some 6,000 inhabitants, with a school, hospital, club, cinema, and other amenities, will be built near the new works.

**The Midland Area Engineers** of Ellison Insulations, Ltd., have been transferred to 36, Bennetts Hill, Birmingham, 2. Telephone No. : Central 5651 (2 lines). Telegrams : "Ellison Phone Central 5651." The Midland Area—roughly from Chester to the Wash and from Bristol to Southwold—will continue to be managed by Mr. E. J. Reynolds, with Mr. W. G. Phelps as Resident Engineer for Wales.

**The Constitution of the Council** of the Association of British Chemical Manufacturers for the ensuing year will be as follows : President, Mr. E. Wallace ; Vice-Presidents, Dr. E. F. Armstrong, F.R.S., Dr. F. H. Carr, C.B.E., F.I.C., Sir Christopher Clayton. C.B.E., Ph.D., F.I.C., Mr. E. V. Evans, O.B.E., F.I.C., Mr. C. A. Hill, B.Sc., F.I.C., Sir David Milne-Watson, Bt., D.L., LL.D., Mr. R. G. Perry, C.B.E.

**It is the Present Intention** of the Council of the Institution of Chemical Engineers that the Associate-Membership Examination shall be held in the usual way in 1941. It is hoped that the Home Paper will be distributed on Jan. 3, and that the remainder of the Examination will be held on May 1, 2, and 3. Should circumstances necessitate any modification of these arrangements, all those concerned will be notified as early as possible.

**Approval was Given** at the monthly meeting of Scunthorpe Borough Council on Oct. 28 to a recommendation of the Gas Committee that application should be made to the Ministry of Health for permission to borrow £5,000 for the construction of a new trunk gas main to Ashby. For some time there have been complaints about the pressure of the gas at Ashby, and it is anticipated that matters will be improved when the new main is in operation.

**Wallasey Emergency Committee** reports that comprehensive schemes have been designed and completed for the interconnexion of mains and supplies of both gas and water between Wallasey and other authorities. In any case of serious damage to any of the undertakings supplies can be arranged and distributed from one or other of the emergency inter-connexions. The establishment of a system of co-ordination with the A.R.P. Wardens and the provision of a staff of inspectors and emergency repair squads are features of the undertaking's preparations.

**The Author** of a Paper to the Rochdale Literary and Scientific Society has kindly forwarded us a reprint of his study of Thomas Newbigging. He is Mr. L. M. Angus-Butterworth, and he does full justice to Newbiggin's versatility, charm, and sincerity. Early in life Newbigging prepared his well-known "Gas Managers' Handbook," which we had the privilege to publish. "King's Treatise," published in three volumes in 1878–82, was another of his works which constituted itself a standard. Newbigging's books had value, comments Mr. Angus-Butterworth, "because he wrote only of what he had real experience."

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## Birmingham Chamber of Commerce Year Book

The fifteenth edition of the Birmingham Chamber of Commerce Year Book appropriately synchronizes with the National drive for increased exports. In this drive Birmingham—often described as the "City of a Thousand Trades"—is well able to play a leading part ; and in this, it is needless to state, the value of gas is fully appreciated. A telling advertisement by the Birmingham Gas Department points to the many advantages of using gas for industrial heat processes and draws attention to the services rendered by the Industrial Research Laboratories—where facilities are provided for gas furnaces to be demonstrated under factory conditions, and the extensive and varied experience of an expert staff is available for the assistance of manufacturers.

Many other firms well known in the Gas Industry find their place in this publication—which, it is emphasized by Mr. John H. Allen, J.P. (President of the Chamber of Commerce), in an Introduction, is not solely a Trade Directory. Within the limits of available space, a substantial amount of information is included of an historical, topographical, and statistical character. The City has long enjoyed a wide reputation for its progressive policy. Its civic activities and recent developments are therefore outlined. The aim of the work, however, is to keep the world informed of the products of the area, and to this end it circulates to the principal trading and importing houses in every quarter of the globe.

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## Reducing Fire Hazard in Coal Piling

A thousand tons of coal a day is used by the Dow Chemical Company. When any one industry's coal requirements reach figures as large as that, several major problems of handling and storage present themselves. For three years this Midland, Michigan, Company's coal handling and storage methods have been attracting nation-wide attention. Wherever coal is used in huge quantities, these methods are either being studied or have already been adopted.

Until 1937, the coal was stored in conical piles of 8,000 to 12,000 tons each. Temperatures were taken weekly, and an average rise in temperature of 0·5° F. per day was noted.

In the past coal was dumped directly from lake boats. Slack was piled loosely just as it fell, allowing free entry to air. In such a pile natural classification soon caused a separation of fine and coarse particles, the former being more firmly compacted than the larger pieces. When a second load was piled on the first, the same thing happened, likewise with each succeeding load.

In the conical pile, between each fine layer lies a coarse one, which, being loosely compacted, constitutes a sort of flue or series of flues. In case of fire these operate in much the same fashion as their counterparts in chimneys. In other words, the warm air rising through them allows cold air to filter through the coal at the bottom of the pile and feed the flames.

It was often found necessary to re-pile the coal in order to eliminate this fire hazard. This involved expense, but the cost was minor compared with that sustained when fires started, as anyone who has had the experience of subduing a blaze in a large coal pile can testify.

Until three years ago, however, the conical method of piling still seemed the most economical, but when at that time it became necessary to carry a larger stock for a longer period of time, various other possibilities in storage procedure were investigated. Coal is now stored in horizontal rather than oblique strata. This eliminates the formation of flues and reduces the fire hazard. There is little need to fear spontaneous combustion since coal is packed so tightly that little oxygen can filter in. In the three years that Dow has been storing its coal thus, no rises in temperature have been noted, even after 18 months of continuous storage.

Since this method of piling coal gives an extremely compact flat plateau, it is necessary to round off the top to insure proper drainage. With the correct pitch it is possible to achieve this with no appreciable increase in the moisture content.—From "Heating and Ventilating."

## THE GAS INDUSTRY IS HELPING IN

# NATION-WIDE SCHEME FOR COMMUNAL FEEDING

PLANS recently announced for extending to all large centres of population emergency feeding arrangements similar to those operating on an increasing scale in London will be of interest to the Gas Industry, particularly suited as it is to provide the means for large-scale catering.

As many as 15,000 hot meals have been served in one day to people rendered homeless as the result of air raids in the London area. No charge is made for these emergency meals, while the menu is varied and the portions are adequate. The London County Council's communal feeding scheme, which has become popularly known as the " Londoner's Meals Service," is a different service from the emergency feeding of the homeless and is an addition to all its efforts in that direction. When the Council began communal feeding it had to start from scratch ; it had to find premises, equipment, personnel, and fuel. Within a week it had 20 centres running ; in three weeks it had some 60 centres and was serving about 3,000 hot meals a day. A continuous survey is carried out from the educational offices enabling the Council to determine where and when the services are required, and immediately a need is found to exist steps are taken to open a centre. Provision has been made for the opening of as many as 200 centres as they are required.

Quite apart from the communal feeding arrangements, voluntary organizations are continuing to open feeding centres throughout the Metropolis. Food is provided at the centres on the basis that people pay the cost of it, together with a proportion of the overhead charges. Officials of the Ministry of Food,which has been operating the scheme through the London County Council, have been impressed by the wish of people in affected areas that they should not be given anything for nothing.

It is recognized that similar problems may arise in other parts of the country, and the Ministry of Food Director of Communal Feeding has visited a number of big towns where it is anticipated that speedy action will be taken. The initiative will be left to the local authorities. In addition, the problem of feeding those who have spent the night in shelters and have to go straight to work in the morning is being examined. Commercial and voluntary organizations have mobile vans operating at selected shelters from 6 a.m., while such vans are also working at different times during the night. Moreover, representatives of the catering trades have been asked to meet Lord Woolton to discuss steps they can take quickly to meet the needs of people who require food at unusual places and at unusual times and who are prepared to pay for it.

Dr. J. J. Mallon, C.H., Warden of Toynbee Hall, has been appointed to advise the Minister of Food on the provision of food and refreshments for people in air-raid shelters in the London area, and he has stated that while the arrangements for catering in larger shelters will go on with all possible speed the people in the brick shelters will not be forgotten.

### A Great Opportunity

With colder weather ahead the demand will be in the main for hot meals, and no matter whether the food is served at communal centres or from mobile canteens, heat will be required to cook it. There is a great opportunity here for the Gas Industry, which is already well versed in the needs of communal catering and fully prepared to provide the necessary equipment.

Meanwhile in many areas gas and electricity have been in short supply, but the Ministry of Food has pointed out that this inconvenience can be overcome by the use of a little ingenuity. When there is just a glimmer of heat in the cooker the housewife may enhance her reputation as a cook by serving a one-pot meal, and this is how she is advised to do it : Choose a saucepan large and deep enough to hold three good-sized stone jam jars. The jars should stand upright so that the lid of the pan will fit over them. Half fill the saucepan with water and put on the stove to boil. In one jar one may cook stew, in another vegetables, and in the third a jam roly-poly pudding. Round the jars in the boiling water potatoes may be cooked in their jackets. The whole meal will cook steadily over a single burner.

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# PITTSBURGH'S INVESTIGATIONS OF GAS LEAKAGE

IN an article in *Gas Age* Dr. J. B. Garner, Director of the Utility Survey Commission of the Mellon Institute of Industrial Research, described results of a systematic and organized investigation of the causes of gas leakage carried out continuously in the Pittsburgh district since 1928. Unaccounted-for gas losses, he explained, have been eliminated, hazards to life and property either from gas leakage or inefficient utilization have been reduced, cordial public relations have been established, and community safety has been enhanced. All these are intangible assets of any business or industry. The insurance and legal values are difficult to appraise.

During the past year 96 cases of carbon monoxide poisoning have been studied. The majority of the cases have occurred during the months when buildings are closed and ventilation is reduced to a minimum. Within the interval Dec. 21, 1939, to Feb. 28, 1940, 44 such cases were investigated.

The appliances which were responsible for the production of carbon monoxide were : 21 water-heaters, eight ranges. six gas furnaces, two hot-plates, one gas refrigerator, and six miscellaneous appliances.

The causes underlying the production of carbon monoxide were : 11 due to inadequate or down-draught in chimneys, four defective chimneys, 19 improperly adjusted appliances, seven appliances with no flue connexion, and three appliances needing repair.

### Study of Causes

A study of the causes of gas leakage has been made as these have been disclosed by the work of the Commission over a period of almost 12 years.

(1) *Carelessness on the part of the consumers or of companies.* Consumers smell gas, or at least think they do, and make no complaint to the gas company. The usual procedure is to try to find the leak with a lighted match or candle. Meter readers often fail to report leakage of gas on meters and meter-connexions. The use of rubber hose or lead pipe, improperly placed or exposed, is a questionable procedure in effecting connexions for gas-consuming appliances. Failure of consumer to remove unused wall-brackets and abandoned house lines is a frequent cause of complaint. The use by consumers of service or house lines as means of support does not contribute to safety.

(2) *Leakage due to accidents.* There are several outstanding causes of accidents to gas lines. Settlement of earth due to coal removal. Contractors who have had to do with the building of pavements, telephone duct lines, and sewers, have in many instances injured gas lines with picks, steam shovels and trucks.

(3) *Faulty repair work.* A lesser number of gas-leakage conditions is due to faulty repair work than to any other of the enumerated causes.

(4) *Gas leakage due to traffic conditions.* Heavy traffic conditions have been the cause of gas leakage on streets where the companies have cast-iron lines. The vibrations due to heavy traffic have loosened the lead caulking in the joints, particularly where they have been laid shallowly.

(5) *Gas leakage conditions due to climatic conditions.* The alternate phenomena of freezing and thawing have been the cause of considerable leakage of both main and service lines. In a cold winter such as we have had this year, the frost has penetrated the ground to a depth of 4 ft. Quite a number of service lines have been found broken off because the frozen ground in yards had expanded or contracted at a materially different rate than conditions have permitted in the street where the service was connected to the main line.

(6) *Gas leakage due to electrolysis.* The main cause of gas-leakage conditions is electrolytic in character. In the Pittsburgh district, large quantities of coal ashes, cinders, and blast furnace slag have been used in the building of streets and in the foundation of sidewalks. All of these materials contain electrolytes—that is, substances which are soluble in water and form solutions which conduct electricity. Service and main lines which are imbedded in such backfills undergo corrosion due to galvanic action. Service and main lines are constantly being renewed or replaced where they have been laid in corrosive backfills. Stray currents from street railways, mines, and other sources of indirect current are taking a toll of underground metallic structures. Many attempts have been made to provide for the drainage of stray currents from lines, but there is still much to be done to abate this cause of leakage.

As time has gone on, the importance of the investigation of gas-leakage conditions has become more and more apparent. The benefits of such work accrue alike to public and the utility. There is a mutual understanding, not otherwise possible, of consumer and utility problems. The work has only begun, and to achieve the greatest economic and civic benefits, other avenues of study must and will be progressively developed. The enterprising executive of the future must give heed to the maintenance of cordial public relations, and the realization of community confidence, in his rendition of gas service in a thoroughly acceptable and economic way.

# MANUFACTURE OF GAS FROM TAR

By G. M. GILL

SINCE the beginning of the present century all towns in California have been supplied with gas from works in which the gas is made from fuel oil. Oil has been plentiful and cheap in that country, and as a consequence the process was developed to make use of this class of fuel.

The type of plant used for gasifying oil is similar in some respects to water gas plant. Thus the generator consists of a steel shell in which is built brickwork of a design and construction to enable oil sprayed into the vessel in company with steam to be brought into close contact with the hot brickwork. In making oil gas, as it is termed in California, it is customary to raise all the steam required by burning under boilers the by-product of the process—namely, a fine carbon, which is washed out of the gas after leaving the generator.

The making of oil gas is intermittent as in a water gas plant, a period of blow being followed by a period of run. During the blow, oil is sprayed into the vessel in conjunction with a blast of air. After the generator has been heated to the required temperature the air is shut off and is replaced by steam, the gas itself being made from oil and steam.

Oil gas is precisely similar to coal gas both in composition and specific gravity. The operation of an oil gas plant can be varied without difficulty to produce a gas which is the same as an over-exhausted coal gas of, say, 0.6 specific gravity as made in horizontal retort plant, or to produce the very light gas with a high percentage of hydrogen as made in modern coke oven plant, or, again, the plant can be operated to make gas of the same composition as is produced in a continuous vertical retort plant with its percentage of water gas.

When one of the large Companies of the Severn Valley Gas Corporation decided to take coke oven gas, an oil gas plant was erected at the gas-works to act as a standby, as it was considered that the standby gas should be of the same composition, specific gravity, and general characteristics as the gas normally supplied. Oil gas was the only type of gas which answered these requirements.

The plant was in due course designed and erected by Mr. Leon B. Jones, of the Jones Gas Process Company, Ltd., 52, Grosvenor Gardens, S.W. 1,—the British counterpart of the Jones Gas Process Corporation of America, which specializes in this type of plant.

Following on the completion of this oil gas plant, it was decided to instal an oil gas plant at the works of one of the smaller subsidiary Companies of the Severn Valley Gas Corporation, but adapted to gasifying tar instead of fuel oil should this be found practicable. The plant was completed, after many difficulties arising out of war conditions, on June 19 last. It was operated for a short time on fuel oil, after which a changeover was made to the tar as normally produced in a continuous vertical retort plant at this particular works. Since that time only tar has been used in the plant.

## Working Procedure

It so happened that the completion of what is now known as the tar plant tallied with a considerable increase in the demand for gas and the necessity for shutting down two of the four vertical retorts for repairs. As a consequence the tar plant has had every opportunity to show its paces and indeed without it there would have been difficulty in maintaining the supply, mainly due to the fact that this Company is supplying 17% more gas than it did a year ago and 28% more than two years ago. The difficulty is all the more pronounced as this works has gasholder storage capacity of 15 hours only on its maximum day, which is a bad condition for a small works with continuous vertical retorts.

Set out is a summarized statement of the tar gas made and a number of details in connexion therewith for the month of September, 1940.

The plant has been started up for the most part in the morning and has been shut down in the afternoon or evening, during which time it has made the quantity of gas calculated to fill the holders by the following morning. It has therefore been used as a peak load plant to make the gas which otherwise would have had to be made by an additional vertical retort operated at low output. The retorts at this works have a capacity of about 80,000 cu.ft. a day of 450 B.Th.U. gas—the declared calorific value. But for the tar plant the extra vertical retort would have been working at a capacity varying from 20% to 60% of its full capacity, which is not an economical method of production.

| Sept., 1940. | Plant in Operation. Hours. | Runs. | Make. cu.ft. | Tar used (galls.). | | | Calorific Value, by Boys Test B.Th.U. | Tar per 1,000 cu.ft. Galls. | Therms per gallon. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Blows. | Runs. | Total. | | | |
| 1 | 2.75 | 14 | 5,833 | 17 | 48 | 65 | 500 | 11.1 | .449 |
| 2 | 8.65 | 50 | 34,833 | 37 | 242 | 279 | 390 | 8.0 | .470 |
| 3 | 8.50 | 40 | 28,600 | 16 | 201 | 217 | 400 | 7.5 | .528 |
| 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 5 | 10.00 | 62 | 37,200 | 36 | 271 | 307 | 410 | 8.2 | .497 |
| 6 | 11.00 | 66 | 54,400 | 13 | 346 | 359 | 400 | 6.6 | .606 |
| 7 | 2.00 | 16 | 11,833 | 12 | 60 | 72 | 440 | 6.1 | .721 |
| 8 | 3.10 | 18 | 6,166 | 29 | 40 | 69 | 470 | 11.2 | .420 |
| 9 | 7.50 | 56 | 34,366 | 28 | 231 | 259 | 410 | 7.5 | .544 |
| 10 | 3.20 | 16 | 7,600 | 24 | 58 | 82 | 430 | 10.8 | .398 |
| 11 | 9.55 | 64 | 34,633 | 22 | 256 | 278 | 430 | 8.0 | .536 |
| 12 | 8.50 | 52 | 38,333 | 24 | 235 | 259 | 380 | 6.9 | .562 |
| 13 | 8.60 | 37 | 18,600 | 21 | 127 | 148 | 430 | 8.0 | .540 |
| 14 | 7.45 | 56 | 39,233 | 15 | 248 | 263 | 400 | 6.7 | .597 |
| 15 | 8.26 | 48 | 32,900 | 25 | 202 | 227 | 380 | 6.9 | .552 |
| 16 | 6.00 | 44 | 31,566 | 20 | 196 | 216 | 380 | 6.8 | .555 |
| 17 | 9.15 | 64 | 45,566 | 21 | 295 | 316 | 370 | 6.9 | .534 |
| 18 | 6.45 | 44 | 30,233 | 18 | 184 | 202 | 380 | 6.6 | .570 |
| 19 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 20 | 4.85 | 40 | 24,500 | 50 | 141 | 191 | 360 | 7.8 | .461 |
| 21 | 3.50 | 28 | 19,100 | 27 | 108 | 135 | 370 | 7.0 | .522 |
| 22 | 3.33 | 28 | 17,933 | 21 | 112 | 133 | 400 | 7.4 | .539 |
| 23 | 7.25 | 48 | 25,867 | 27 | 180 | 207 | 400 | 8.0 | .500 |
| 24 | 7.55 | 60 | 38,666 | 21 | 267 | 288 | 390 | 7.4 | .523 |
| 25 | 9.5 | 64 | 48,100 | 19 | 316 | 335 | 370 | 6.9 | .531 |
| 26 | 5.2 | 40 | 24,500 | 18 | 175 | 193 | 380 | 7.8 | .482 |
| 27 | 14.7 | 68 | 50,066 | 17 | 332 | 349 | 350 | 7.0 | .501 |
| 28 | 6.0 | 25 | 22,410 | 16 | 155 | 171 | 380 | 7.6 | .498 |
| 29 | 2.7 | 21 | 9,533 | 16 | 73 | 89 | 380 | 9.3 | .408 |
| 30 | 6.0 | 46 | 25,733 | 26 | 192 | 218 | 390 | 8.4 | .459 |
| Total | 191.24 | ... | 798,303 | 636 | 5,291 | 5,927 | 11,170 | ... | ... |
| Average | 6.8 | ... | 28,510 | ... | ... | ... | 399 | 7.4 | 0.537 |

It is anticipated that materially better results will be obtained in the future, as there is still much to learn about the correct gasification of tar in a plant of this kind, and the results now being achieved are considerably better than they were during the first month's operation. This is not surprising when it is realized that this has never before been attempted in a plant of this kind. For instance, it has been found that a material improvement has resulted from spraying considerably hotter tar, free from water, into the generator.

## Gas Analysis

The character of the gas made is shown in the figures set out below. These are the average of the last six complete analyses made of the tar gas.

As will be observed, the composition of the gas is close to that of ordinary coal gas with a decreased content of saturated hydrocarbons. If fuel oil were used instead of tar, the calorific value of the gas would at once rise to something between 500

| $CO_2$. | $O_2$. | CnHm. | CO. | $CH_4$. | $H_2$. | $N_2$. | Boys Test B.Th.U. per cu.ft. | Specific gravity. | Total $H_2S$ and other Sulphur Compounds. Grains per 100 cu.ft. | Naphthalene. Grains per 100 cu.ft. |
|---|---|---|---|---|---|---|---|---|---|---|
| 4.4 | 0.3 | 1.1 | 11.8 | 18.2 | 47.6 | 16.6 | 419.0 | 0.485 | 45.2 | ... |
| 4.1 | 0.3 | 1.1 | 11.7 | 19.5 | 50.3 | 13.0 | 430.4 | 0.47 | 77.7 | 3.4 |
| 3.4 | 0.2 | 1.0 | 11.7 | 16.8 | 57.3 | 9.6 | 415.2 | 0.43 | 85.0 | 3.6 |
| 3.3 | 0.1 | 1.0 | 12.1 | 16.0 | 55.4 | 12.1 | 412.3 | 0.42 | 105.7 | 4.1 |
| 3.7 | 0.1 | 1.2 | 11.8 | 15.1 | 57.8 | 10.3 | 411.2 | 0.44 | 103.9 | 1.5 |
| 2.5 | 0.3 | 1.3 | 11.8 | 16.1 | 61.0 | 7.0 | 422.7 | 0.405 | 103.4 | |

and 600 B.Th.U. per cu.ft. To obtain a gas between 450 and 500 B.Th.U. per cu.ft. it would be necessary to be wasteful of tar and to use a larger quantity per therm of gas made, but this is not necessary in this particular case, as it is quite practicable and economical to make a coal gas of, say, 480 B.Th.U. to mix with a tar gas of 400 B.Th.U., so giving a district gas of 450 B.Th.U.

There have been the usual initial difficulties in starting an entirely new process, and it was realized that much had to be learned, but the troubles experienced have been virtually confined to the mechanical operation of the pump which is used to provide a hydraulic pressure of 800 lb. per sq.in. for the operation of the valves which control the working of the plant. A solution appears now to have been found for this difficulty, and the disclosed weakness in the design of the pump has been remedied while a new type of pump has also been ordered as a standby.

### A Valuable By-product

In making gas from tar there is, as in the case of fuel oil, an important by-product—namely, a fine carbon which is washed out of the gas as it leaves the generator. This carbon is deposited in settling bays, and when sufficiently freed from water it is shovelled out for air-drying before being fired into a boiler for raising the steam required for the process. This fuel is sufficient to raise all the steam required, and this has been the normal method employed in California, but we are now engaged in experimenting with other means of using this by-product as we feel that it can be more usefully employed for some other purpose than as a boiler fuel. The quantity of carbon produced in the process is considerable, but this quantity is likely to be reduced as the gas produced per gallon of tar is increased. During the month of September, 1940, the amount of carbon produced was approximately equivalent to 5 cwt. of carbon on the dry basis per ton of tar used.

We anticipate that the gas produced per gallon of tar will show a steady improvement as further experience is gained, while if the plant were used continuously it is probable that substantially better results would in any case be obtained in this respect. However, the plant was installed for making peak load gas in order to keep the coal gas plant working steadily at the same rate of production day by day, which we are confident is a method of operation which must lead to a lower cost of coal gas.

One advantage of importance in connexion with a plant of this type is that the raw material, being a by-product of coal carbonization, is already stored in the works, and no additional storage need be provided. Seeing that the by-product of the process is quite suitable for raising the steam required for making the gas, there is the advantage that expenditure on producing the gas is limited to little more than wages and repairs and maintenance of the plant.

It will not be overlooked that this process is likely to take a considerable quantity of tar off the market, and indeed it is possible to contemplate that if the process is developed on a large scale, the removal of, say, 20% of the tar from the market might enhance the market value of the remaining 80% to the value of the original 100%.

At the present time tar has to be made irrespective of the demand for the commodity, and it will not be denied in the Industry that it has for a long time been selling well below its intrinsic value. A use such as is indicated in this article may well go a long way towards solving this problem.

Much of the success of this innovation must be placed to the credit of Mr. Leon B. Jones, who designed and installed the plant, and then instructed the present operators under the supervision of the Manager of the Gas Company, who is entitled to full credit for his enterprise in recommending the adoption of the plant, especially having regard to the fact that this particular Company makes only 66 million cu.ft. per annum.

Should any gas engineer wish to visit the plant he is quite at liberty to do so after making the necessary arrangements with the writer of this article, whose address is the Gas Works, Cheltenham.

# PROBLEMS OF COUNTRY GAS-WORKS*

By J. J. RICHARDSON

*(Supervising Engineer and Chief Gas Examiner, Department of Works & Government, N.S.W.)*

EXCLUDING the two Metropolitan Companies (The Australian Gas Light Company and the North Shore Gas Company, Ltd.) and the City of Newcastle Gas & Coke Company, Ltd., there are, in New South Wales, 34 gas undertakings, of which 18 are controlled by councils and 16 by companies, all of which may be classed as country gas-works undertakings. In 1939 the consumers and some of the assets of the Wallsend & Plattsburg Gas Company, Ltd., were transferred to the City of Newcastle Gas & Coke Company and the former Company ceased to exist. The problems of these undertakings are undoubtedly common throughout Australia, but this Paper is based on personal knowledge of New South Wales undertakings only.

Much loose thinking has been and is still being applied to the Gas Industry. As an Industry *per se* and, therefore, stripped of its encumbrances, legislative, administrative and incompetent technical, gas supply to consumers is fundamentally sound. Thermal energy is a necessity in any modern community. Gas and electricity should be the only forms of thermal energy in such communities, and, therefore, wood, coal, and oil should be excluded wholly in the case of domestic consumers and largely in the case of industrial consumers.

The problems of any undertaking may be, broadly, divided under two headings, technical and financial. Each reacts on the other and an undertaking which is technically deficient cannot under the present system of keen competition be financially sound. Moreover an undertaking which is financially weak cannot be technically strong because sufficient money is not available to ensure technical strength.

The criteria of technical strength are :

1. A supply of gas at a reasonably constant calorific value.
2. The maintenance at all times of sufficient pressure and a constant specific gravity at consumers' appliances.
3. Gas constantly free from sulphuretted hydrogen and other harmful constituents.
4. Minimum losses (difference between gas manufactured and gas sold).

Experience indicates that gas may be varied plus or minus 20 B.Th.U. from the standard calorific value for which an appliance is adjusted without appreciably affecting the efficiency or usefulness of the appliance. And with reasonable care the calorific value of the gas supplied by all undertakings in this State should be maintained constantly (accidents excepted) within the limits mentioned—that is, plus or minus 20 B.Th.U. A recording calorimeter should be installed in all works to ensure that a reasonably constant calorific value is maintained.

Investigations into the pressure conditions in country towns prove that this is one of the most serious problems to be solved. The attempt to transmit gas for long distances in small mains at low pressure ; the use of 1-in. pipes for distributing mains and ¾-in. pipes for services ; the neglect over long periods of years which has allowed mains and particularly small mains and services to become partially or completely choked by internal corrosion ; and the continued use of 18 cu.ft. (3-light) and even 30 cu.ft. (5-light) meters of antique design and construction, all of these are prevalent factors which limit the quantity of gas which may be used by a consumer, and cause dissatisfaction due to fluctuating conditions of supply. As an extreme case a town which had 2,140 consumers and gas sales of 29 million cu.ft. per annum in 1932 may be quoted. In this town about 80% of the meters were 18 cu.ft. (3-light), the small mains and services were neglected, and consumers could not obtain the gas required for their purposes. The consumption of gas per consumer, excluding one consumer with a consumption of over 2 million cu.ft. per annum, was 9,000 cu.ft. per annum. The number of consumers now is 1,270 and the sales of gas less than 18 million cu.ft. per annum. And it was found that not a few residences equipped with cooker, bath heater, and copper were provided by the

* A Paper to the Australian Gas Institute.

supply authority with an 18 cu.ft. meter. Action has been commenced to substitute modern meters of normal capacity and to clean out all small mains and services. Unfortunately this undertaking, in common with several others in the State, has been living on its capital for many years, and instead of the system having received attention year by year and reasonable reserves having been accumulated, has been trading at an actual cash loss year by year. In another town the holder was able to throw a pressure of 3.2 in. Daily, the average pressure throughout the town, at the time of maximum draw-off, which lasted for about 1½ hours, did not exceed 1.6 in. and in some parts of the town the pressure is as low as 1.0 in.

The statutory requirements are a minimum of 2 in. between the hours of 5 a.m. and 9 p.m. and 1½ in. between the hours of 9 p.m. and 5 a.m. Time and temperature control cooking and heating processes. The temperature of products of combustion is not seriously affected by reduced rates of flow of gas produced by low pressures, but low pressures seriously extend the time to complete the process, cause increased losses and, therefore, reduced efficiencies, and entirely subvert the admitted advantage of gas over other forms of thermal energy—namely, the high rate of heat evolution required for water boiling and similar processes. It is, therefore, desirable to maintain at the time of maximum draw-off a minimum of 2.5 in. and preferably 3 in. at consumers' appliances.

The statutory method of testing for sulphuretted hydrogen is not effective as an indicator of the quality of gas supplied at all times to consumers. Four official tests carried out at intervals over a period of two days in a country works apparently indicated the gas was pure continuously during that period. A continuous $H_2S$ recorder, however, proved that twice during that period flushes of impure gas were supplied to consumers. The statutory method has been, in other cases, sufficient to prove the presence of impurity and in such cases recommendations have been made to avoid a recurrence. In one case, the trouble which had been recurrent over a long period of years was removed by preheating the gas before it entered the purifiers. The preheating was effected by surrounding an 11-ft. length of 9-in. cast-iron pipe with a hot water bath.

## Financial

The surplus or deficit as revealed in the published balance-sheet or statement of accounts of an undertaking need not necessarily be accepted as a reliable criterion of the true financial stability of that undertaking. In each case, it is necessary to examine the component parts of the sheet or statement. An undertaking which could not reveal otherwise than a financial deficit would naturally stint appropriations to depreciation, reserves, and contingencies, and, in the case of local authorities, might include appropriations from other funds. And it need not be stressed that any undertaking to be financially sound must have sufficient revenue to pay in full all expenses properly chargeable to revenue, including working expenses—expenses necessary to produce gas and deliver it to consumers—interest, dividends, depreciation, sinking fund, reserves, obsolescence, and contingencies.

Many years of patience and perseverance appear to be necessary to convince authorities responsible for the successful operation of gas-works undertakings that success can be obtained and maintained only by the introduction of a rational system of charging for gas supplied as the basis of operations. It is utterly irrational to incur expenditure of 100d. to deliver 1,000 cu.ft. of gas to a consumer and to collect from that consumer 76d. for that same 1,000 cu.ft. as is actually occurring in a city in New South Wales at the present time. Reasonable prices should, also, be charged for coke and tar.

A rational tariff should—

1. Produce sufficient revenue for the purposes of the undertaking.
2. Avoid a loss to the undertaking in supplying any consumer.
3. Promote—
   (*a*) An increase of consumers.
   (*b*) An increase in consumption of gas by consumers.

A study of current tariffs, particularly of electricity tariffs, reveals the multiplicity of forms a tariff may assume. Good points may be found in most of them and the advantages and disadvantages of most forms of tariff have been discussed many times in papers, books and trade journals. The only tariff which in the opinion of the Author satisfies the three requirements set out above and is suitable for country works is the block tariff. In large cities and probably in some large country towns a more equitable form of tariff is the " graded block tariff." Gas undertakings are severely handicapped by tradition which makes it inexpedient to charge, as in the case of electricity undertakings, a high rate (5d. per unit or more) for primary units. A review of the many factors involved, however, indicates that in all towns, large and small, an appropriate rate for the first block of gas consumed by large and small consumers alike is 1d. per gas unit. Slight variations from this rate may be justified for some particular undertaking, but the desirability of uniformity in rates and the assistance which unanimity of opinion would give to the general introduction of tariffs based on a maximum of 1d. per gas unit indicate that such slight variations should be avoided. The rate of 1d. per gas unit for the first block does not ensure immunity from losses in supplying small consumers. A rate of 5d. or higher would probably exclude most of the unprofitable consumers.

Rates of this order avoid consideration of minimum charges to which usually objection is made and which generally are undesirable as being a hindrance to a good relationship between supplier and consumer. It should, however, be recognized that a minimum is to a large extent concealed in high rates for primary units. The proposed rate of 1d. per gas unit for the first block being insufficient to satisfy the second requirement of a rational tariff, a minimum charge must, perforce, be introduced. The correct amount of the minimum charge varies from town to town and is difficult to assess exactly but generally a minimum of 3s. 4d. a month is reasonable. At 1d. per gas unit the first block would be 40 units or for gas at 511.8 B.Th.U. per cu.ft., 600 cu.ft. per month. The annual consumption would be 7,200 cu.ft., which is considerably less than half the consumption of an ordinary home equipped with necessary gas-consuming appliances. Most consumers would, therefore, use the whole of the gas in the first block and some gas in other blocks at lower rates. The determination of the subsequent blocks depends largely on local conditions, and it is convenient to consider, first, the lowest rate in the tariff. Four blocks appear to be sufficient for any town and a simplification is introduced by arranging the first three blocks to cover the revenue necessary for ordinary expenditure. By ordinary expenditure is meant all management, capital, labour, and other charges, and the cost of losses in the distribution system. In other words, the first three blocks should produce the revenue now required to carry on the business as at present. The cost of gas in the fourth block delivered to the consumer should, therefore, be little more than the net cost of delivering gas into the holder. If the fourth block rate is made at least 50% higher than the net cost of the gas delivered into the holder a price is obtained which makes competition with other forms of energy easy and ensures a profit of at least 33% on the gas sold at this rate. The highest and the lowest rates having been determined the two intermediate block rates are selected to give the revenue required.

Examples of two tariffs framed recently for country towns are as follows :

| **Tariff A.** | **Tariff B.** |
|---|---|
| Monthly Accounts. | Monthly Accounts. |
| First 45 gas units at 1d. | First 48 gas units at 1d. |
| (Minimum charge, 3s. 9d.) | (No minimum charge.) |
| Next 90 gas units at 0.80d. | Next 96 gas units at 0.75d. |
| Next 90 gas units at 0.60d. | Next 96 gas units at 0.50d. |
| Balance per month at 0.33d. | Balance per month at 0.40d. |
| Calorific value, 512 B.Th.U. | Calorific value, 546 B.Th.U. |
| 15 gas units in 100 cu.ft. | 16 gas units in 100 cu.ft. |

In including these notes on tariffs, attention is invited to an account of " The Gas Industry in Germany " by Fritz Schuster which appeared in the Aug. 12, 1939, issue of the *Gas World*. The account is exceedingly interesting and valuable and in referring to tariffs the Author states, " There are various types of domestic tariff, the so-called graded block rate being most common. Its universal introduction is anticipated. The two-part tariff, based on a substantial standing charge which is independent of the consumption, is still occasionally encountered. The block rate represents a considerable advance. . . . If the block rate is adapted to meet closer requirements, such as occur in most towns, we come to the graded block rate." The Author then gives the following as an example of a graded block tariff :

**Specimen Charges on Graded Block Rate**

| Number of Rooms. | Monthly Consumption, cu.ft. At 5s. 7d. per 1,000 cu.ft. | At 3s. 4d. per 1,000 cu.ft. | At 2s. 3d. per 1,000 cu.ft. |
|---|---|---|---|
| 1 to 2 | 353 | 388— 706 | 706 |
| 3 | 706 | 742—1413 | 1413 |
| 4 | 1059 | 1059—2119 | 2119 |
| 5 | 1413 | 1448—2825 | 2825 |
| Over 5 | 1765 | 1801—3531 | 3531 |

It is interesting to note that the lowest rate is 0.4 of the highest so that if the highest rate, that is for the first block, were 1d. per gas unit the rate for the last block would be 0.4d. per gas unit.

The adoption of this ratio in a trial tariff, basing the lowest rate on 50% above the net cost of placing gas into the holder, generally results in a revenue close to the revenue required.

Australia should not lag behind Germany in the " universal introduction " of a rational tariff for gas, a suggestion which might be accepted by either our National Gas Association or Australian Gas Institute.

### Constructive Planning for the Future

The object of any analysis is to reveal the true conditions and facts, the weaknesses and deficiencies for the purpose of initiating new methods and control, which may, in some cases, necessarily be drastic, but will ensure the building up, the construction of a structure, homogeneous and complete, pleasing to behold and entirely free from the scars and blemishes, the energy-sapping wounds, which characterize the Gas Industry at the present time. The existence of untrained and the dearth of trained men in the Industry need not be stressed. Men trained to manage country gas-works are, of course, meant. Youths and men cannot be trained for these positions in a few hours. Several years will be necessary to rectify the condition. Untrained men will, in most cases, disappear by the effluxion of time, and time will allow youths to be trained for managerial positions. In the meantime tolerance and patience will ameliorate the conditions.

Four important steps forming an interrelated tetrad of factors in a complete plan were initiated in one case eight years ago. The plan is, therefore, not new. Many delays and deliberate obstructions, some of which appear enshrouded in an atmosphere of purposeful premeditation, have been encountered in rearing it to its present condition of childhood.

1. Training of apprentices.
2. Examination of gas engineers.
3. Formation of a Gas Advisory Committee.
4. Education and training of *de facto* gas managers.

1. *Training of Apprentices.*—Standard Articles of Apprenticeship were prepared and have been approved by the Apprenticeship Commission of the Department of Labour and Industry, N.S.W. An Award, supplementary to the Articles, has also been prepared and approved. Apprentices, in addition to the usual covenants, covenant to study diligently the subjects included in the syllabus of the Gas Engineers' Examination referred to later, and to submit themselves for examination within six months of the date of the expiry of the apprenticeship period. The gas engineer, under whom the apprentice will work, covenants to train the apprentice in the profession of gas engineering and the employer (Council or Company) covenants to supply free a complete set of text-books recommended in the examination syllabus.

Present circumstances indicate that in most country towns the gas engineer and the apprentice will form a team of two to fulfil the objects of the Agreement, but such outside assistance in the training of the apprentice as is possible will, undoubtedly, be rendered freely. An intensive course of study is contemplated and a course of study with, probably, annual examinations of a voluntary nature will be arranged as aids to the apprentices in satisfying the Examination Committee. Apprentices have already been appointed to four of the larger country works and action is being taken to make further appointments. In one case a Council has decided to appoint an apprentice in its works, the output of which is about 10 million cu.ft. per annum. The circumstances, however, are unusual in that the gas manager is fully qualified to train an apprentice.

Appointments to much larger works are being delayed pending rearrangements which will ensure that the apprentice will have the opportunity of successful training.

The Standard Articles of Apprenticeship and Award were published on Dec. 8, 1939, in the " N.S.W. Industrial Gazette " and were included in the monthly part for December, 1939 (Vol. LVI).

2. *Examination of Gas Engineers.*—It is understood that the Gas Managers' Association of New South Wales had for many years endeavoured to introduce by legislation the certification of gas managers. In the 1932 Gas and Electricity Act, Section 59, it was specified that " No person shall, after the commencement of this Act, be appointed as manager of any gas company or electric light company unless he shall have passed the prescribed examination." No examinations were held and therefore gas managers continued to be appointed as before. The 1932 Act was repealed by the 1935 Gas and Electricity Act, and in this Act, Section 82 specifies that " After the commencement of this Act a person shall not be appointed by a gas company to superintend its gas-works unless he holds the prescribed certificate as to his technical qualifications,"—a significant alteration which has caused much difficulty.

In the 1932 Act the designation " Manager " was definite, but that term having been omitted and the governing word " superintendence " substituted, it follows that a strictly legal designation for persons appointed to superintend works would be " Superintendents." It has, however, been possible to include the designation " Gas Engineer " in the regulations, which accords with the Act in respect of " Technical qualifications " and limits the subjects for examination to technical and associated matters. Commercial matters, including finance and salesmanship, are, however, excluded. An examination for " Gas Manager " would necessarily have included the subjects of Bookkeeping, Accountancy, and Business Principles. A certificate as " Gas Engineer " does not prevent a person properly qualified in business management from managing a gas-works undertaking, in which case an appropriate designation would be " Gas Engineer and Manager."

Many delays have occurred in completing action under the Act, but now (July, 1940) 69 certificates have been issued.

The names of books recommended by the Gas Engineers' Examination Committee and the syllabus of the examination appear in Regulations published in the " N.S.W. Government Gazette," No. 86, of June 9, 1939.

3. *Formation of a Gas Advisory Committee.*—The N.S.W. State Government appointed a Gas Advisory Committee in September, 1939. The Committee is attached to the Department of Works and Local Government, N.S.W., which administers the Gas and Electricity Act.

The functions of the Committee are :

(*a*) To investigate generally the conditions of country gas undertakings with the approval of the authorities controlling such undertakings ; and—

(*b*) To advise the Government generally as to the requirements necessary to ensure the maintenance of a supply of gas to consumers under the most economical conditions.

The Committee is limited in its powers because before an investigation can be made the approval of the authority controlling an undertaking must first be obtained. Moreover, an authority need not necessarily accept the recommendations of the Committee. Despite these handicaps the Committee has been successful in avoiding the closure of at least one undertaking in New South Wales.

4. *Education and Training of* de facto *Gas Managers.*—The fact that many gas managers are now in positions which they held for many years and which they intend to hold until retirement cannot be overlooked. Several of these men, prior to promotion as gas manager, were employed as stokers, and in some cases have, therefore, long years of service with the same authority. Gas supply was established in several country towns many years before electricity. The obsolete and inefficient methods which were associated with gas supply in the early days have been perpetuated, and are in striking comparison with the methods adopted in connexion with electricity supply. Modern electricity tariffs have been introduced in towns where gas supply had grown old and was without sufficient energy to adopt the same tactics as its new competitor. Sales campaigns, including showrooms and time-payment purchases, have been introduced, with enthusiasm and confidence, into towns by the authorities controlling electricity supply, and in those same towns and even where gas supply is under the control of the same authority, the electrical activity is accentuated by the lifeless attitude exhibited towards gas. A typical expression, " If people want gas they will buy it," heard many times in country towns, and adopted as a basis of action, or more strictly, inaction, is, probably, the most appropriate slogan which could have been suggested by a competitor, who instead of waiting for a customer to buy goes out to sell the product of his business. The absence of salesmanship in many country towns is a severe handicap to progress. A scheme of mutual assistance centred on a salesman in continuous employment by an organization such as the National Gas Association should effectively and economically remove this handicap. The ground is being prepared by constant propaganda, but progress is slow, due to the atmosphere which has been allowed to develop around the Industry, and the difficulty in convincing supply authorities of the correct procedure to adopt in order to raise the business of gas supply on to the plane where it rightly belongs.

I conclude with the expression of a regret—that a Plan for the Future as outlined above was not actively commenced at least 15 years ago, and a quotation :

> " German gas engineering can boast of an excellent organization which gives substantial support to progress in every respect and to the promotion of the professsion generally."—*Fritz Schuster.*

# HEATING OF FACTORIES

[Contributed]

"IN every workroom in which a substantial proportion of the work is done sitting, and does not involve serious physical effort, a temperature of less than 60°F. shall not be deemed, after the first hour, to be a reasonable temperature while work is going on." So reads Part I, Sect. 3 of the Factories Act, 1937, and it is doubtful if any Government regulation has afforded the Gas Industry so much scope for expansion as does the paragraph quoted.

The adaptability of town gas to what is now familiarly termed space heating is limitless. It is the one fuel which, if necessary, can be conveniently conveyed to the precise spot at which it is to be used, and at the same time is simply controllable within fine limits, is clean, economical, and can be efficiently utilized through a wide range of well-designed appliances.

While actual heat input is the primary factor—*i.e.*, replacement of heat losses through the fabric, doors, windows, and air circulation—other factors must be considered in factory heating which do not arise to the same extent when dealing with public buildings, schools, churches, and private houses. Many

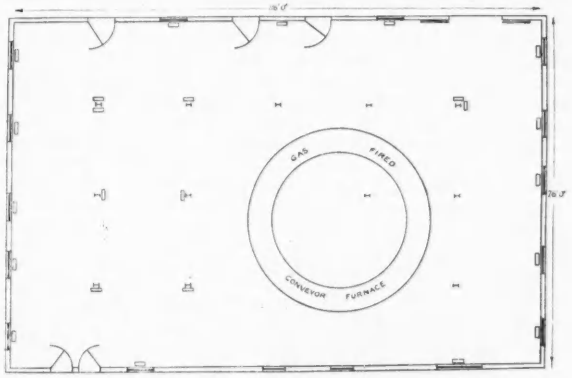



FIG. 1.—*Finishing and Packing Room, heated by Steamless type Gas Radiators with heat controls.*

*Radiators :* ▭

industrial processes necessitate the employment of fans or other ventilating media for the removal of fumes or dust and thereby raise the problem of frequent air change and rapid loss of heat by air dispersed from the building. Floor and wall space is usually of infinite value in any factory, and therefore due consideration must be given to any desire to keep such space freed from obstruction. Some processes, too, give off inflammable vapours and dusts which call for care in the selection of a heating system which can be reasonably expected to give safe and trouble-free service.

Many architects still show a decided partiality towards heating through the medium of a centrally situated boiler and the co-incident system of circulating pipes conveying either steam or hot water to the points it is desired to warm. One cannot visualize a gas-fired steam boiler being installed for heating purposes unless the heating is carried out as a secondary operation after the steam has performed the work for which it was originally introduced. In such circumstances steam provides an economical method in that its cost is often considered as negligible. Against this view must be ranged the fact that in extremely cold weather the residual heat may be insufficient to meet the comfort of the employees, with the result that the boiler must be worked at greater capacity, the primary process must suffer, or the employees must be inconvenienced.

The one real advantage of steam heating—*i.e.*, rapid warming of the building—is more than counteracted by the tendency to over-heating in the immediate vicinity of the circulating pipes, the smell which arises through partial charring of dust, the need to provide sufficient ventilation to ensure the rapid dispersal of over-heated contaminated air, and the difficulty of maintaining a uniform temperature.

More satisfactory results are attained where hot water central heating is employed. Due to the lower temperature of the water compared with that of steam, smell is largely eliminated, but larger pipes and larger radiating surfaces are needed to obtain an equal degree of warmth. Much greater uniformity of heat distribution is effected, though there is a considerable time lag and the system does not respond quickly to changes in weather conditions. Some speeding-up of heating is possible by the use of pump circulation, but both steam and hot water systems have the same disadvantage that the central boiler plant must be in operation at all times when heat is required and therefore must often be operating under conditions conducive neither to efficiency or economy.

Mention has been made of the fact that gas can conveniently be conveyed to the point of utilization, a feature that is often not emphasized to the extent its importance warrants. With this method of heating it is equally important to know the precise heat losses of the building, and to calculate on an input sufficient fully to compensate them. Automatic temperature control can be incorporated if desired, but even without such refinement the method has much to commend it to the notice of all factory owners. With each unit under separate control the radiators can be spaced to ensure comfortable hygienic conditions for all employees ; radiators near doors and other exposed positions can be used at times when the other parts of the factory feel comfortably warm without the use of any additional form of heat.

Capital costs for independent heating are considerably less than with a central system, and maintenance costs, with properly designed and constructed steamless type radiators, are negligible. Where floor space is not available the panel type radiator can be conveniently fixed on walls or supported from brackets on the stanchions and pillars and offers a simple solution to the problem of uniformity in heating. Workers in factories and similar establishments cannot be expected to give the same care and attention to apparatus that might be expected in the home or in shops, and radiators of substantial and foolproof construction become essential.

Fig. 1 shows a layout of gas radiators in the finishing and packing warehouse of a factory. It had been the intention of the firm to use the waste gases and heat from the furnace as a means of heating the building. The builders of the furnace, however, carried out such an efficient job of work and so well insulated the walls of the furnace that little heat was derived therefrom. Careful tests were taken of the temperature and roof of the conveyor furnace, and the heat emission therefrom subtracted from the total calculated heat requirements to maintain an internal temperature of 65°F. with an outside temperature of 32°F. Steamless gas radiators of a capacity to cover the balance plus 15% were installed, and the success of the scheme may be gauged from the fact that in February, 1940, with an external temperature of 21°F.—*i.e.*, 11° below freezing point—the minimum temperature recorded inside the building was 61.8°F.

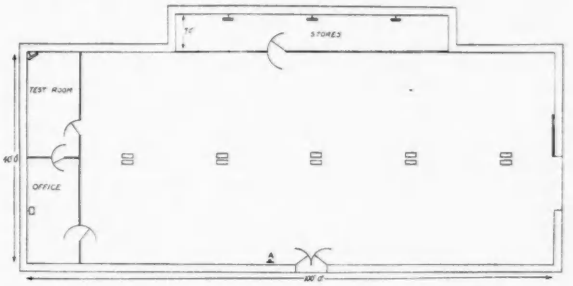



FIG. 2.—*Turning Shop heated by Gas Air Circulating Units* (1 *and* 2) *controlled by Room Thermostats* (1A *and* 2B) *set at* 65°*F. Chart shows period heaters in operation (approximately* 5½ *hours including heating-up time, after works have been closed for week-end). Actual working day* 8.30 *a.m. to* 5.30 *p.m.*

Provided the workshops and offices are not less than 12 ft. to 15 ft. in height—and this is usually available in the modern factory—heating by overhead radiant units affords a most convenient system. Two methods are available, the low temperature type and the high temperature visible radiance type. Both types of heater are made in a variety of sizes and shapes adaptable to the conditions and positions in which they are to be used. In either case it is inadvisable to base the number of units required on any principle other than that of maximum heat requirements of the building calculated in accordance with the usual methods. Inspection of a large number of installations shows that many appear to have been based upon a superficial theory that a certain size of heater is capable of heating satisfactorily a certain floor area. To say the least, this

is a serious misconception, and practical tests of a number of installations show that it does not always apply and may lead to complaints of inadequate heating.

The low temperature heater consists essentially of an outer casing enclosing a refractory material and a number of gas burners of the industrial pattern, heat from which, along with the products of combustion, is directed towards the refractory material and then conducted through the inner passages of the heater prior to being allowed to pass into the atmosphere. An overall efficiency of 90% is claimed for this type of heater, plus the advantages of low capital cost, low installation cost, freedom from heavy maintenance charges ; and, as gas is consumed at ordinary low pressure, there is no expense or running costs for fan or motor. Uniformity of temperature can be assured, since the pressure of gas is governed and remains constant, and automatic control by room thermostats can be incorporated if necessary.

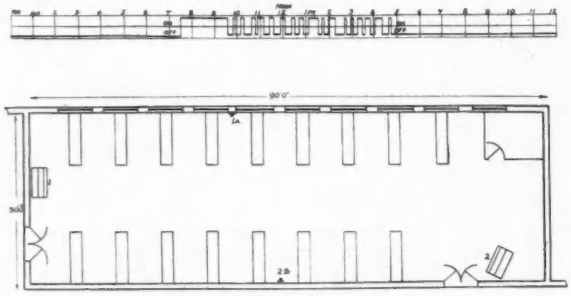


FIG. 3.—*Engineering shop heated by Radiant Gas Panel Heaters, with Room Thermostat* A *set at 65°F.*
*Panel Heaters :* ▭

The high temperature radiant heater is now available as a low pressure gas unit as well as in its original form employing gas or air under pressure, or pre-mixed gas and air. In both systems the principle of burning the gas on the surface of a refractory block remains substantially the same. The fact that the surface becomes brightly incandescent is certainly a strong psychological feature in favour of the high temperature panel. The workers can actually see a visible source of heat and thereby " feel " the system to be effective. Tests taken with various types of both low and high temperature radiant heaters show that by this method a feeling of perfect comfort is apparent even with a temperature 5°F. below that which usually applies.

Fig. 2 shows an engineering shop, stores, and testing room, heated by the high temperature radiant panels using gas at a pressure of 90 in. W.G. When first installed some difficulty was experienced in maintaining the required temperature. This was largely due to the height of the building—some 30 ft.—and to the fact that a large door was almost continuously open for the delivery of goods. Due to the blackout regulations it has been necessary to build a light-trap around this doorway which has decreased the ingress of cold air, and since this was fixed there has been no difficulty in keeping the internal temperature well above the stipulated figure.

With the high temperature systems employing gas under pressure care must be taken that adequate filtering arrangements are made to ensure that dust-free air is entrained at the injector. If not, the refractory brick may become clogged and seriously interfere with the efficiency of the system. In the latest type of radiant heater employing porcelain tubes in place of the refractory brick, this dust trouble is much less apparent, and complaint is unlikely to arise except under conditions of extremely dust-ladened air.

Capital cost, cost of installation, and maintenance charges with the pressure system of overhead heating are higher than with other forms of radiant panel heating, and the system is not suited to conditions which call for absolute freedom from noise. On the other hand there is a decided advantage in the point that the emission of heat begins almost immediately the gas is ignited and conditions in close proximity to the heaters become comfortable almost instantly.

Radiant heat, like light, travels in straight lines, and as the object of the system is to warm the occupants rather than the room itself, the disposition of the heaters should be arranged so that occupants are not constantly passing from hot zones to cooler ones. Tests indicate that in the worst conditions a feeling of comfort is established by radiant heating, although the air temperature of the premises is some degrees below that normally required by other systems.

In an air-heating installation the primary object is to raise the temperature of the air to the point which ensures comfortable conditions for the workers. It is, of course, not possible to heat to a uniform temperature every cubic foot of air which enters a building. Allowance must be made for that which enters through doorways and windows, and for infiltration from other sources. The obvious way, then, is to heat a proportion of the total volume of air to a temperature sufficiently high to ensure that when it is distributed and intermixes with the balance of air in the building the resultant temperature will be that required to meet the desired conditions. Care must be taken not to over-heat the air by installing relatively small heaters and working them at high temperature. This will result in streams of hot dry air and give rise to acute discomfort to those workers contacting the streams.

The ordinary systems of heating as applied to factories do not provide for ventilation or movement of the air other than the natural movement which follows the heating of the air by convection. As a result, ventilation is dependent either on doorways, window openings and similar means of egress, or the provision of ancillary ventilation plant. Air-heating systems therefore serve a twofold purpose in that they can be used during the warmer months to send a current of cooling air through the workshops.

Gas-heated air-warming units consist essentially of a combustion chamber housing a series of burners, the products and heat from which pass through a series of tubes—usually gilled to give speedier heat transference—around which is passed a stream of air from a motor-driven fan. In the larger units the heating chamber is often a separate sheet-metal unit from which ducts are carried to the rooms to be heated, and the air is distributed from the ducts through specially designed louvres which prevent excessive draughts. Small self-contained units which may be suspended from the ceilings or supported in other suitable positions are also provided with directional louvres, and in many cases with swivel attachments whereby the units may be used to direct the heated air to any point.

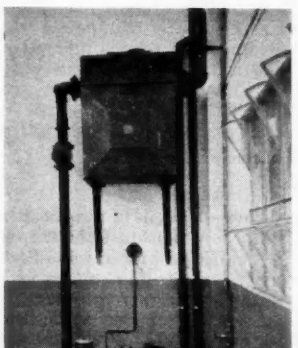


FIG. 4.—*Gas Meter, Motor, and Compressor for Radiant Panel Heaters in Engineering Shop.*

Both types are so constructed that the products of combustion may be passed into the stream of heated air and thereby increase the heat available. Since the volume of products is small in relation to that of the heated air and the total volume in the building, there is little danger of the $CO_2$ content of the total air being increased to any appreciable extent.

If necessary, the air for heating may be drawn from outside the building, or, if taken from inside, arrangements can be made to pass the air through cleansing and cleaning filters before it actually passes over the heating tubes. Wherever possible thermostatic control should be incorporated in the system ; the cost will easily be saved in the first heating season.

Fig. 3 shows a turning shop heated by two gas heaters (1 and 2) each separately controlled by the room thermostats 1A and 2B set at 65°F. The building is in an extremely exposed position, with the east side almost wholly glass. As will be seen from the chart, recording a typical winter day's working of the heaters, after the week-end closing down the temperature is easily maintained at the required figure.

Air heaters are available with an output of from 40,000 B.Th.U. to 500,000 B.Th.U. per hour, and where the smaller units are employed it will usually be found that the capital cost is lower than with other methods of heating. Even the larger systems with central plant and ducting to the various rooms compare favourably as regards installation costs with other systems. As a rule an efficiency of at least 80% can be guaranteed, and maintenance costs are reasonable low.

Allowance must be made in running costs for the current used by the fan motors. Although these costs for a number of small units will be higher than that of a large central plant, the increased flexibility of the smaller units and the fact that each may be used independently as required will probably result in a lower actual cost over the whole heating season.

# SCOTTISH JUNIOR GAS ASSOCIATION

## (WESTERN DISTRICT)

**Meeting held at Glasgow on Oct. 26**

## Presidential Address

of

WILLIAM KIRK

*Engineer and Manager, Motherwell and Wishaw Corporation Gas Department.*

ON the outbreak of war twelve months ago many schemes were shattered and fresh plans had to be drawn up to meet with the altered situation. Our Association, among many others, had to readjust programmes, and as a result of the adjustment you are to-day listening to the second Presidential Address within the short space of seven months.

The importance of the Gas Industry in time of peace is undoubted, but in time of war its value is incalculable. The Industry is contributing to the national war effort, in addition to gas, huge quantities of the following raw materials, all of which are vital in the prosecution of this struggle to retain and maintain liberty: Coke, concentrated ammoniacal liquor, tar, sulphate of ammonia, and benzole.

### Carbonization

The carbonizing unit has reached a high state of efficiency and it is difficult to point out how a further increase in efficiency could be effected. Nevertheless, there are still one or two avenues through which the actual working results could be improved.

The approach to the question of improved working results lies in the direction of more thorough washing and blending of coal. Day in and day out visible evidence of the unsatisfactory washery methods at the collieries are presented to us, and it would appear that letters of complaint are more often consigned to the W.P.B. than attended to. In some instances a semblance of recognition is made, but the matter does not go much further than that. The thorough washing of the coal will remove most of the extraneous matter, and this is bound to influence the ash content. The importance of reducing the ash content is amply and graphically brought out if we think for a moment that a reduction of only 1% means a saving of approximately £450 when 35,000 tons are being carbonized annually. This is approximately 3d. per ton.

The provision of facilities for blending coal gives one a greater command over the type of coke which can be produced. It also permits of low-caking coals being carbonized with coals of a high agglutinating value without the disadvantage of producing large quantities of breeze.

The point may be raised at this juncture as to why coal is not purchased on a quality basis, and I think that the answer to such a question would be that as the coal owner neither manufactures nor produces the coal, but only extracts it, the quality cannot be guaranteed. Mother Nature, it is often said, cannot be improved upon, and with this we may agree ; but what we do disagree about is the large quantity of non-carbonaceous matter which is sold to us as Mother Nature's carbonaceous compounds.

The question of the disposal of the unremunerative breeze has received considerable attention within recent years, and as an outcome, breeze-burning producers are now in evidence. It is as yet too early to state if this is a definite success, as the experimenters are only getting over their teething troubles. Obstacles are bound to crop up when a new departure is attempted, but I am sure that in the course of time these troubles will be surmounted and a profitable outlet for breeze will be obtained.

### Coke

As time passes it becomes more and more evident that the production, grading, and scientific utilization of coke must receive more attention than hitherto.

In the production of coke for domestic and industrial use, the following points are of paramount importance : (1) The ash content, (2) ignitability, (3) combustibility, and (4) reactivity.

There is no need for me to enlarge upon the desirability of having as low an ash content as possible, and this question is undoubtedly bound up with the washing and blending of coal. In days gone by, the ash content was not such a factor as it is to-day. The perfecting of oil burners—*e.g.*,crude oil, petroleum, creosote, &c.—has made the ash content of coke a factor to be reckoned with. And why ? The answer is easy to see in some respects. No sane business man will buy a commodity to put it in the ash bin, and while the initial cost of some other types of fuel may be dearer he may be purchasing a greater number of usable B.Th.U. when the ash content is taken into consideration.

The ignitability of coke has always been a drawback to its universal adoption and many methods have been evolved to overcome this difficulty. Any admixture or treatment such as coating with coal dust or the addition of waxes, oils, &c., must of necessity increase the cost of the final product, and it is therefore desirable that the reactivity during combustion should be accomplished during production of the coke. This would be more simple and economical as compared with the preparation after production.

The grading of coke has within the past few years been the foremost subject for criticism, and the importance of selling the right grade of coke for specific purposes is now being realized. After all, the grading of coke is only the application of common-sense principles to the question. It will be readily apparent that a coke graded to burn in a small hothouse fire will not necessarily give the same efficiency in a baker's oven or a mantel register. It is, therefore, necessary to ascertain as far as is practicable the use to which coke is being put and to supply the grade of coke calculated to give the best efficiency. Coke-grading plants cost money, and well I know it ; but I think that the capital will earn its reward handsomely. You may argue that it is not possible to ascertain the correct grade to supply every time, but that is no excuse for behaving like an ostrich.

### Dry Purification Process

The dry purification process impresses me in a number of ways. First, the space occupied is usually six to ten times greater than that taken up by the scrubbers dealing with the same quantity of gas ; secondly, the laborious manhandling of material involved in the process, or as in large installations the provision of costly mechanical handling plant ; thirdly, the operating charges ; fourthly, the maintenance charges ; and lastly, the high initial capital cost.

The lack of suitable supplies of natural bog ore and the difficulties usually attendant upon the use of artificial oxide have amply demonstrated to my mind the need for some other convenient and reliable process to take the place of the generally accepted method.

I remember some time ago reading an article on the Koppers " Thylox " process with sulphur recovery, and I gained the impression that this process eliminated most of the objections outlined above and was credited with an efficiency of 98% in the removal of sulphur and 100% in the removal of hydrocyanic acid. I cannot give details of operating charges, but a considerable saving in space is one advantage and a cleaner and less corrosive product is another, while the addition of the make-up solution is not, I am certain, as arduous a task as emptying a box, and a by-product obtained which is nearly 100% pure is definitely to the good. I am not aware if there is such a plant in Scotland, but I am hopeful that some enterprising engineer will remedy this state and that we may be favoured with the experience and working results of it.

At this juncture I might be permitted to refer to the large number of water heaters and flueless appliances which have been fitted within recent years, and these tend to make the removal of sulphur compulsory. The reduction in the sulphur content would be directly beneficial as appliances would require less maintenance with a consequent reduction in distribution costs. The consumers would benefit also by having an appliance which would be trouble free, thereby enhancing the prestige of gas. Where the undertaking has a huge industrial load for heat treatment purposes, the removal of sulphur would improve the performance of the furnaces, muffles, &c., in use and new markets and greater loads would be obtained.

### Gum Formation

With the increasing use of small by-passes, another problem has arisen, and that is gum formation in the distribution system. The formation of gum is apparently due to the interaction of small quantities of nitric oxide, oxygen, and unsaturated hydrocarbons. It would appear that most of the nitric oxide in the gas is due to waste gases being drawn into the retorts from the waste gas flues and at the retort mouthpieces. The removal of this nitric acid is not by any manner of means a simple process, as very little is abstracted in the wet purification plant although 50% may be absorbed in the purifiers.

The gas leaving the purifiers contains nitric acid, but no gum. The gum is mostly formed in the holders and is deposited in the tank, but any nitric acid leaving the holders is free to react to form gum during distribution.

One authority puts forward the view that gasholders have two other functions in addition to that of storage—namely,

(1) To allow nitric oxide in the gas time to react, and
(2) To allow any gum formed to settle.

To overcome the difficulties experienced in this direction it would appear that the retorts and retort mouthpieces must be kept tight and worked at a slight pressure. This question would also give a pointer to the placing of a gas drying plant, since the more moisture the gas contains entering the holder, the greater would be the deposition of the gum, thus indicating that all gas-drying plants should be placed on the outlet of the holder.

### Education

The Education Scheme of The Institution of Gas Engineers continues its good work in directing the steps of the students in the proper channels for their ultimate enlightenment in Gas Manufacture, Gas Supply, and the kindred subjects.

Much constructive and destructive criticism has been levelled at the efforts of the Education Committee in administering the scheme, and while constructive criticism is appreciated at all times, and a wise man invites such, it would appear to me that most of the criticism emanating from the students is destructive with not one whit of good constructive suggestion. When one hears a student loudly lamenting his fate in one direction and another, a little research in most cases reveals the fact that the student himself has not fulfilled the prescribed conditions. When that is so, should any sympathy be expended upon his case? Admittedly, cases of hardship are bound to arise, but from actual experience I can vouch that sympathetic and understanding consideration is given to students so placed.

The Certificates of the Institution are not to be thrown about as if a leaflet raid were in progress, and the Education Committee is doing a fine job of work in maintaining a high standard of education, and this is most essential if any worth is to be placed on the Certificates.

That the scheme is far from perfect will be readily admitted by the Education Committee itself, but the obstacles are slowly but surely being overcome If the Institution possessed Colleges and Technical Schools all over the country, there would be no difficulty in formulating an ideal course, but as the Scheme is dependent upon the facilities made available by the Education Authorities in Great Britain, the Institution is very much in their hands, and subject also to the idiosyncrasies of the Principal in the individual schools. That being so, it will be apparent that the Institution's Educational Committee have a most difficult task in co-ordinating the facilities available—a task which they are tackling with determination and which is already bearing fruit.

Just one word more on this question. The student aspiring to managerial responsibilities must equip himself against the time thereof, and I would advise him to pursue a " business course " for a couple of years following completion of his engineering studies. The time will be well spent, and there are many colleges and correspondence schools catering for the demands in this field. Such a course might comprise book-keeping and accountancy, secretarial practice, company law, mercantile law and costing.

While on the subject of costing, let me here say a word on this particular aspect of the Industry. To me it would appear that this science receives very scant consideration, and generally speaking it is done in a lackadaisical manner or not done at all. There does not appear to be any accepted standard for assessing the value of each individual unit of the undertaking and the principles of costing, according to one's own particular idiosyncrasies, are juggled about with a dexterity which would amaze even a magician.

And now for a final word on this subject. A few years ago one of the Technical Publications produced a three-monthly booklet entitled "The Signpost," which gave a brief résumé and references of the more important subjects dealt with in their paper in the preceding three months. I think that it would not be out of place if The Institution of Gas Engineers sponsored a similar idea, and produced a small book capable of slipping into one's pocket and giving a brief summary of the Author's conclusions on the various subjects presented to the Institution over the past three years. This would ensure that the engineer and manager and technical assistants' memory would be refreshed on the more important subjects dealt with in that period, and would also bring their knowledge more up-to-date.

### Sales and Publicity

Old traditions die hard, and it is only within the last ten years or so that the Industry has awakened to the full realization that showmanship and salesmanship are vital necessities in all undertakings.

Gone are the days when gas and appliances sold themselves—gone also are the ideas, I hope, that profits are made in the retort house. In their stead has been born the realization that gas must now be sold (and sold it must be in competition with other forms of fuel which are by no means inferior to gas) and that increased sales bring increased profits.

Looking over the results of successful undertakings within recent times, it will assuredly be noted that these undertakings have a well-defined sales policy and the trained staff to carry it out. Trained men with specialized knowledge of salesmanship and the art of display must be employed if success is to be achieved. This is no time for half-measures, because business lost is seldom regained.

The salesman must have a workshop and what better could he ask for than a well-appointed showroom. Where could his ingenuity have more scope than in the showroom window displays and with a subject unlimited in its possibilities? To me the showroom windows are an invaluable media for expressing and representing to the public the policy of the undertaking. Smart, refreshing and topical displays are ever an interest to the passing public, and it is my conviction that the potential gas consumer draws from these displays his first conclusion as to the service likely to be obtained.

We are slowly but surely doing away with the conservatism of yesterday, and no showroom is now up-to-date unless it has its own lecture and demonstration theatre complete with projection room and " talkie " device for films. This in its wake has brought about the employment of a full-time demonstrator and the facilities for making regular demonstrations a feature of the propaganda policy. The recent campaign by the Ministry of Food is a case in point where much publicity was obtained by the undertaking having the aforementioned facilities. The employment of a whole-time demonstrator offers tremendous scope for contacting Women's Associations which are now many and varied in every town and village. It may be argued that many undertakings are unable to support a full-time demonstrator, but could this difficulty not be surmounted by a co-operative agreement with surrounding undertakings?

Of all the innovations for selling gas brought into vogue in recent times, there is only one in my opinion which has achieved considerable success, and that is the promotion of sales on hire purchase. Hire-purchase schemes are of recent origin in many undertakings, and I talk of Scotland only in this respect. The idea has been slow in developing, but is the only logical means of promoting sales. The number of consumers who can afford to purchase outright is a small section of the total consumers, but the majority are able to pay a quarterly premium, and this potential market has been allowed to remain undeveloped until hire purchase was introduced. The success attendant upon its introduction has proved that these facilities were needed, and the sponsors have not been let down. Another system which is worthy of mention is that of " Pay Through Meter." This departure has resulted in thousands of consumers having their burners replaced without feeling the strain of paying, and I am sure that thousands of gas irons and pokers have been sold by this method.

### Motor Traction

Towards the end of the last war it was no uncommon sight to see a number of vehicles lined up to receive a supply of gas in lieu of petrol. At the conclusion of hostilities, with the consequent increase in petrol supplies, the question of utilizing coal gas was apparently dropped, but now that the world war No. 2 is upon us with a greater demand for petrol than ever before experienced, the gas bag is again beginning to show itself.

One cannot be truthful and say that the research for a petrol substitute has been dormant, as there are on the market to-day vehicles running solely on crude oil, and portable producers utilizing coals of low volatile content have been extensively

experimented with and brought to a point of commercial feasibility.

There are still many difficulties to be overcome, and a criticism may be levelled at the lack of foresight in not having the problems tackled more energetically, but this lack of initiative may have been engendered by the cheapness and availability of more or less standard quality petrol. Another point which may have militated against the development of town gas is its limited scope—in other words, no journey of any appreciable distance can be conveniently undertaken. It would appear to me that the determination of the fuel to be used falls naturally into two classes :

(1) Long-distance work—portable gas producers.
(2) Short distance work—town gas in gas bags or compressed in steel cylinders.

Figures on the economics of the whole business have been published and the inference is that a definite commercial proposition exists, but until more actual experience is gained over a wider area, and under more varying circumstances, a discussion on the question of costs, &c., is not politic at the moment.

## DISCUSSION

Mr. KELLOCK (Airdrie, President of the North British Association of Gas Managers), opening the discussion, congratulated Mr. Kirk on the spirit of optimism conveyed by his Address. Speaking on the tradition of the Junior Gas Association, Mr. Kellock hoped that the high standard set by the original members would be maintained to-day.

Mr. K. GRAHAM (Glasgow, Vice-President of the Association) said that Mr. Kirk's remarks on education had his full support. He was sure that most students received treatment worthy of their efforts.

Mr. A. SHAND (Falkirk) asked if the cost of washing coal should be borne by the buyer. He added that the elimination of sulphur contents from gas was essential for the efficiency of water heaters, and that sales efforts should be supplemented by a good maintenance system.

Mr. C. POULSON (West's Gas Improvement Co., Ltd., Manchester) remarked that the President had referred to the high efficiency of present day carbonizing plant, and the difficulty of exploring avenues for further development in this direction. Nevertheless, plant designers were continually striving to effect further improvements. Mr. Kirk referred also to the disposal of unremunerative breeze, and following upon experiments over the past several years, the use of coke breeze as a producer fuel has now become established by means of the breeze burning, or pressure, producer. The removal of the fines, or part of that fraction below ¼ in., was desirable to give uniform conditions throughout the fuel depth. As to the economies effected, Mr. Bateman, of Kilmarnock, had dealt with the subject in his Paper to this Association, and, later, Mr. Dixon, of Newcastle, in his Paper to the North of England Gas Managers' Association in 1937, set out a financial balance-sheet, based on values at that time, operating four producers, and showed a balance in favour of breeze burning after allowance had been made for additional charges of maintenance, steam, &c. In Mr. Kirk's Address the " Thylox " process was referred to. This method of sulphur removal was described in very full detail by Dr. Foxwell and Mr. Grounds in a joint contribution to the Institute of Fuel, March, 1939. To quote the Authors there appeared to be 21 such plants in existence—ten in the U.S.A., six on the Continent, and five in Japan. In the original units soda served as the alkaline component, but later soda was replaced by ammonia, thus considerably cheapening the process. Information regarding operating costs was, the Authors pointed out, approximate, and varied from 0.6d. per 1,000 cu.ft. of gas, using soda as alkali, down to 0.17d. per 1,000 cu.ft. using ammonia as alkali.

Mr. MCLAREN (Newton-on-Ayr) spoke on the question of breeze burning producers, saying that his experience was, the cleaner the coke the better were the results obtained. He added that artificial oxide had been used by him, and the sulphur content obtained was 52%, which he thought was a good result. Mr. McLaren went on to say that, if their weight could be kept down, cylinders were much better for gas for motor tractors than the more often used gas bag. He also asked if there was a carburetter on the market suitable for various calorific values of gas.

Mr. GREIG (Glasgow) thought that coal-washing methods would not change much in the future. Regarding the sale of coal by quality, Mr. Greig wondered how they would pay miners in a mine producing coal of high ash content. He thought Mr. Kirk's remarks on the old type of purification were not quite correct, as modern processes required greater care, more attention, and in addition technical control. He also agreed with Mr. McLaren about breeze-burning producers. What he wanted was clean flues and high temperatures.

Mr. J. D. COUPER (Forth & Clyde & Sunnyside Iron Co.) agreed with Mr. Kirk's remarks on sales and publicity. He said that the competition of electric cookers was becoming very keen, although they were still behind the gas cooker in performance. He expressed the wish that manufacturers would always keep ahead of the electric cooker. This, together with good salesmanship, would maintain the lead already held by the Gas Industry.

Mr. ORR (Motherwell), comparing past and present costs of coal, showed that to-day gas undertakings expected well graded, washed coal, for the price paid.

Mr. N. STURROCK (Greenock), concluding the discussion, expressed the view that Mr. Kirk had given a very general paper, but he was sure that everyone would have been pleased to hear a few details of the many improvements recently made in Mr. Kirk's own Works.

Mr. KIRK, replying to the discussion, thanked Mr. Kellock for his kind remarks. He agreed with Mr. Graham that there should be no relaxation on the education programme, as a sound education and a good practical training were essential. He emphasized his remarks on coal washing. Mr. Kirk suggested that the tar distillers dealt better with tar than the gas-works, as many undertakings could not afford the necessary plant for treatment. Regarding the question of tar for roads, he said that the British Road Tar Association had laid stretches of road which had stood up well to the test. Replying to Mr. Greig's remarks on old purifiers, Mr. Kirk considered that the worst job in the gas-works was the emptying of purifiers. He hoped that the present system would be improved. He agreed that undertakings were being well supplied by manufacturers, who were co-operating and making progress in all types of gas appliances. Mr. Kirk concluded by saying he had been fortunate to be in charge of the latest improvements made at Motherwell, and hoped that a visit by the Association to his works could be arranged at a later date.

# Gas Undertaking Results

### Dumbarton

While the quantity of gas made by the Dumbarton Gas Corporation during the twelve months ended May 15 was 250,785,000 cu.ft., as compared with 258,387,000 cu.ft. in the preceding year, the quantity accounted for was 241,475,300 cu.ft., as against 242,684,200 cu.ft. Thus the amount unaccounted for was only 9,309,700 cu.ft., as compared with 15,702,800 cu.ft. a year ago—3.71%, as against 6.08%. The amount received for public lighting has decreased from £1,660 to £262 ; but the revenue from sale of gas (less rebates) is £30,777, against £27,005. The Net Revenue Account shows a balance on hand at the beginning of the year of £4,300, and at the end of the year of £1,445. In the result, the accounts show a debit balance of £3,040, as compared with a debit of £592 a year ago.

### Gas Supply Company

The report of the Directors of the Gas Supply Company, Ltd., for the year ended June 30 states that (including the amount brought forward) there is a profit of £19,304, as compared with £18,530 for the preceding twelve months. After the payment of a dividend of 5½% for the year (the same as last year), the carry forward will be increased from £536 to £613. The Company, whose headquarters are in Melbourne, are engaged in the supply of gas to a number of towns. The volume of gas sales was 8.1% more than in the previous year, while a year ago the Directors were able to record an increase of 12%. New carbonizing plant at Gympie has been completed, and additional purifiers have been installed at Sale, Ararat, and Stawell. Main extensions were carried out at most of the places. A coal strike during the year did not find the Company unprepared, for they had sufficient stocks to maintain full supplies at all the works, though certain additional costs were incurred.

### Kendal

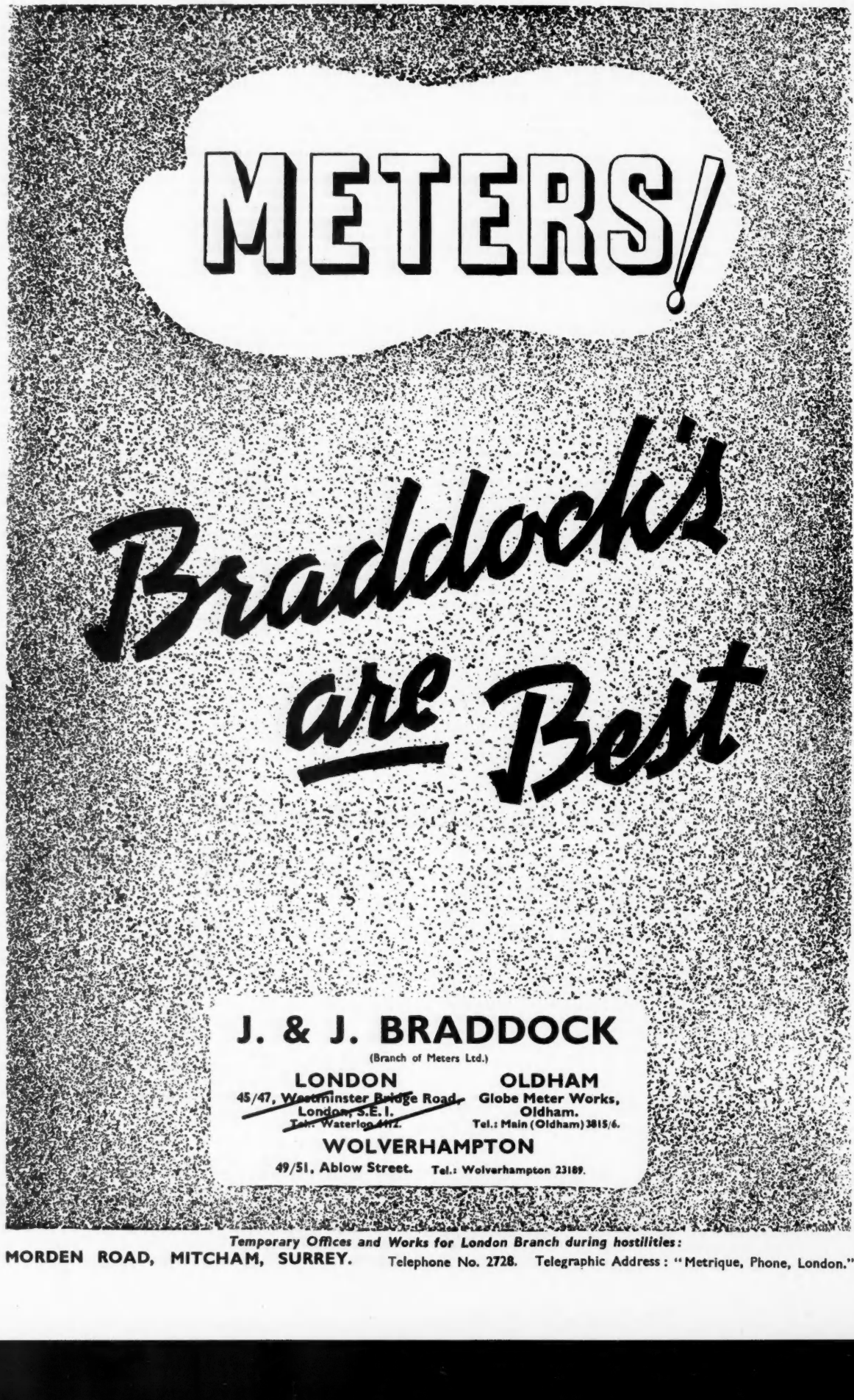
The accounts of the Borough of Kendal Gas Department for the last financial year show a gross profit of £6,819. Costs, of course, have risen, as has been the case elsewhere, and certain expenditure of an exceptional character has been incurred during the year. Then, too, there has been a loss in revenue on public lighting amounting to £1,197. Having regard to all the circumstances, the Council view the results as being satisfactory.

### Nelson

The accounts of the Nelson Corporation reveal a net loss on the gas undertaking for the past financial year of £2,793, as compared with a net profit of £1,461 for the preceding twelve months. The total income shows a reduction of £5,254, at £98,441. Receipts from public lighting were less by £5,775.

### South Australian

The Directors of the South Australian Gas Company, in their report for the year ended June 30, state that, after paying interest on bonds, and adding the balance of £20,437 brought forward from the previous year, the profit amounts to £139,088. The payment of a dividend of 5% per annum, and the transfer of £41,780 to the Special Purposes Fund, will leave an increased balance of £27,307 to be carried forward. The dividend is unchanged. The Company supply Adelaide.

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# Gas Products Prices

## The London Market

Nov. 11.

There is no alteration in the prices of Tar Products in the London Market. Present values are as follows: Pitch is nominal; creosote is about 4⅜d. to 5d. per gallon, refined tar 3⅜d. to 4d., the price of pure toluene under the Ministry of Supply Toluene No. 2 Order is 2s. 5d. per gallon, pure benzole is 1s 10d., 95/160 solvent naphtha 1s. 11d. to 2s. 0d., and 90/160 pyridine about 17s. 6d. all per gallon naked, refined naphthalene crystals £23 per ton in bags, all *ex* Makers' Works.

## The Provinces

Nov. 11.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North 9½d. to 10d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 5d. to 1s. 6d. Creosote, *ex* works, in bulk, North liquid and salty, 4½d. to 4⅝d.; Scotland, 4½d. to 4⅝d.; low gravity, 4½d. to 4⅝d. Fuel Grade 4d. to 4½d. Carbolic acid, 60's, 3s. 9d. to 3s. 10½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4⅝d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 5½d. to 5⅝d.; filtered heavy oil (min. gr. 1,080), 5⅜d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6½d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, p. 404.

## Tar Products in Scotland

GLASGOW, Nov. 9.

Demand for all products is, if anything, increasing and prices continue steady.

**Refined tar.**—Price in the home market is firmer at 4½d. to 4⅝d. per gallon, while for export quotations are unchanged at 3½d. per gallon, both f.o.r. naked.

**Creosote oil.**—Specification oil, 5d. to 5½d. per gallon; low gravity, 6d. to 6½d. per gallon; neutral oil, 5⅜d. to 6d. per gallon; all *ex* Works in bulk.

**Cresylic acid.**—Demand is on a small scale with quotations as follows: Pale, 99/100%, 2s. 2d. to 2s. 4d. per gallon; Pale, 97/99%, 1s. 11d. to 2s. per gallon; Dark, 97/99%, 1s. 7d. to 1s. 9d. per gallon; all *ex* Works in buyers' packages.

**Crude naphtha.**—Supplies, as available, are valued at 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

**Solvent naphtha.**—90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 Heavy Naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

**Pyridine.**—90/160 grade is 17s. to 18s. per gallon and 90/140 grade is 19s. to 20s. per gallon.

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# GAS STOCKS AND SHARES

During the early part of last week business on the Stock Exchange was inclined to broaden, but the shortage of supplies of stock prohibited any marked increase in the volume though prices remained firm. Gilt-edged stocks continued to show improvement, and 2½% Consols closed on Thursday at 76 against 75 the previous week. Numerous gains were also recorded among all classes of home rails, the shortage of supplies being particularly noticeable in this section. Industrials remained confident and a number made advances, but oil and rubber shares continued quiet.

With the exception of a few dealings in the stocks of some leading undertakings there was very little business done in the Gas Market last week and prices everywhere remained almost unchanged. The only alteration in the Official List affected two Tottenham stocks, the ordinary falling 3-points to 70 and the 5% preference 4½ to 80, business in the latter being recorded at 82. In the Provinces a drop of 3 to 97½ occurred in Bath Consolidated, while nominal quotations in the Supplementary List remained unchanged.

Interim dividends of 2½% on the "A" shares and 2½% on the "B" shares have been declared by the Directors of Gas Consolidation, Ltd. These rates are the same as a year ago.

# Quotations on the London and Provincial Stock Exchanges

## OFFICIAL LIST

| Issue. £ | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations Nov. 7. | Rise or Fall on week. |
|---|---|---|---|---|---|---|
| 1,767,439 | Sept. 16 | 7 | 7 | Alliance & Dublin Ord. ... | 102—112 | ... |
| 374,000 | July 1 | 4 | 4 | Do. 4 p.c. Deb. ... | 90—95 | ... |
| 957,608 | Nov. 4 | 5 | 5 | Asscd. Gas & Water U'd'ts Ord. | 12/—14/-* | ... |
| 500,000 | ,, | 4½ | 4½ | Do. 4½ p.c. Red. Cum. Pref. | 15/6—17/6* | ... |
| 535,545 | ,, | 4 | 4 | Do. 4 p.c. Red. Cum. Pref. | 14/6—16/6* | ... |
| 336,646 | ,, | 4 | 4 | Do. 4 p.c. Irred. Cum. Pref. | 12/—14/-* | ... |
| 561,370 | Aug. 12 | 7 | 7 | Barnet Ord. 7 p.c. ... ... | 100—105 | ... |
| 300,000 | Oct. 14 | 1/9⅓ | 1/4⅙ | Bombay, Ltd. .. ... ... | 19/6—21/6 | ... |
| 690,407 | Aug. 19 | 7 | 7 | Bournemouth 7 p.c. max. ... | 100—110 | ... |
| 362,025 | June 17 | 4 | 4 | Do. 4 p.c. Deb. ... | 75—85 | ... |
| 659,955 | Aug. 19 | 6¾ | 4⅝ | Brighton, &c., 5 p.c. Con. ... | 65—75 | ... |
| 855,000 | Sept 30 | 8 | 6 | Brit. Gas Light Ord. ... ... | 75—85 | ... |
| 545,000 | June 17 | 5½ | 5½ | Do. 5½ p.c. 'B' Cum. Pref | 110—115 | ... |
| 120,000 | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. | 75—80 | ... |
| 10,000 | Nov. 6, '33 | 6 | 4 | Cape Town, Ltd., 4½ p.c. Cu. Pf. | ¼—¾ | ... |
| 626,860 | July 15 | 5⅞ | 6 | Cardiff Con. Ord. ... ... | 89—94 | ... |
| 24,500 | Sept. 23 | 7 | 7 | Colombo Ord. 7 p.c. Pref. ... | 19/—21/- | ... |
| 764,169 | Oct. 7 | -/11.48 | -/11.48 | Colonial Gas Assn. Ltd. Ord. ... | 14/—16/- | ... |
| 400,000 | ,, | 1/3.30 | 1/3.30 | Do. 8 p.c. Pref. ... | 19/—21/- | ... |
| 1,748,935 | July 22 | 2 | 3 | Commercial Ord. ... ... | 37—42 | ... |
| 620,000 | June 10 | 3 | 3 | Do. 3 p.c. Deb. ... ... | 58—63 | ... |
| 286,344 | Aug. 19 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 88—93 | ... |
| 807,560 | Aug. 12 | 7 | 6 | Croydon sliding scale ... ... | 83—88 | ... |
| 644,590 | ,, | 5 | 5 | Do. max. div. ... ... | 90—85 | ... |
| 620,385 | July 1 | 5 | 5 | Do. 5 p.c. Perp.Deb. ... | 90—95 | ... |
| 179,500 | Aug. 19 | 5¼ | 5 | East Surrey 'B,' 5 p.c. ... ... | 75—80 | ... |
| 176,461 | June 17 | 5 | 5 | Do. 5 p.c. Deb. (Irred.)... | 90—95 | ... |
| 250,000 | July 8 | 4 | 6 | Gas Consolidation Ord. 'B' ... | 13/6—14/6 | ... |
| 250,000 | May 13 | 4 | 4 | Do. 4 p.c. Red. Cum. Pref. | 15/—17/- | ... |
| 19,152410 | July 29 | 3⅜ | 4½ | Gas Light & Coke Ord. ... | 13/6—14/6a | ... |
| 2,600,000 | ,, | 3½ | 3½ | Do. 3½ p.c. max. ... ... | 52—57 | ... |
| 4,477,106 | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. ... | 70—75 | ... |
| 2,993,000 | July 8 | 3¾ | 3¾ | Do. 3¾ p.c. Red. Pref. ... | 80—85 | ... |
| 8,602,497 | June 3 | 3 | 3 | Do. 3 p.c. Con. Deb. ... | 65—70 | ... |
| 3,642,770 | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 100—105 | ... |
| 3,500,000 | ,, | 4½ | 4½ | Do. 4½ p.c. Red. Deb. ... | 98—103 | ... |
| 700,000 | Sept. 9 | 3¼ | 3¼ | Do. 3¼ Red. Deb. ... | 80—85 | ... |
| 5,600,000 | May 13 | 4 | 8 | Imperial Continental Cap. ... | 34—39 | ... |
| 43,820 | July 29 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 63—68 | ... |
| 231,978 | Aug. 19 | 5 | 5 | M.S. Utility 'C' Cons. ... ... | 68—73 | ... |
| 918,657 | ,, | 4 | 4 | 4 p.c. Cons. Pref. ... ... | 72—77 | ... |
| 675,000 | May 6 | †4 | †4 | Montevideo, Ltd. .. ... | 52—57 | ... |
| 300,000 | Apl. 29 | 9 | 7 | Oriental, Ltd. ... ... ... | 100—110 | ... |
| 368,537 | June 3 | 7 | 8 | Plymouth & Stonehouse 5 p.c. | 90—100 | ... |
| 621,667 | Aug. 19 | 8⅛ | 7½ | Portsmouth & Gosport Cons. | 97—102 | ... |
| 648,999 | Sept. 16 | 1/1 | 1/1½ | Severn Val. Gas Cor. Ld. Ord. | 13/—15/- | ... |
| 597,972 | ,, | -/10⅝ | -/10⅝ | Do. 4½ p.c. Cum. Pref. ... | 15/6—17/6 | ... |
| 2,528,714 | Sept. 2 | 1/- | -/7½ | South East'n Gas Cn. Ld. Ord. | 9/—11/- | ... |
| 1,000,000 | ,, | -/10⅛ | -/10⅝ | Do. 4½ p.c. Red. Cum. Pref. | 14/—16/- | ... |
| 1,068,869 | ,, | 4 | 4 | Do. 4 p.c. Irred. Cum. Pref. | 13/—15/- | ... |
| 6,709,895 | Aug. 5 | 4 | 4 | South Met. Ord. .. ... ... | 53—58 | ... |
| 1,135,812 | ,, | 6 | 6 | Do. 6 p.c. Irred. Pref. ... | 95—105 | ... |
| 850,000 | ,, | 4 | 4 | Do. 4 p.c. Irred. Pref. ... | 65—75 | ... |
| 1,895,445 | July 1 | 3 | 3 | Do. 3 p.c. Perp. Deb. ... | 60—65 | ... |
| 1,000,000 | July 15 | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 95—100 | ... |
| 1,543,795 | July 22 | 3 | 4 | South Suburban Ord. 5 p.c. ... | 60—70 | ... |
| 512,825 | July 8 | 5 | 5 | Do. 5 p.c. Perp. Pref. ... | 88—93 | ... |
| 500,000 | ,, | 4 | 4 | Do. 4 p.c. Perp. Pref. ... | 60—70 | ... |
| 250,000 | ,, | 3⅜ | 3⅜ | Do. 3⅜ p.c. Red. Pref. ... | 80—85 | ... |
| 888,587 | June 10 | 5 | 5 | Do. 5 p.c. Perp. Deb. ... | 90—95 | ... |
| 750,541 | Aug 9 | 5½ | 5 | Southampton Ord. ... ... | 58—63 | ... |
| 350,000 | Feb. 12 | 5½ | 5½ | Swansea 5½ p.c. Red. Pref. ... | 91—96 | ... |
| 1,076,495 | Aug. 5 | 5 | 5 | Tottenham & District Ord. ... | 65—75 | −3 |
| 338,555 | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 75—85 | −4½ |
| 453,380 | June 10 | 4 | 4 | Do. 4 p.c. Perp. Deb. ... | 78—83 | ... |
| 1,247,505 | May 20 | 4 | 6 | U. Kingdom Gas Cor. Ord. ... | 12/—14/- | ... |
| 1,085,952 | May 13 | 4½ | 4½ | Do. 4½ p.c. 1st Cum. Pref. ... | 13/6—15/6 | ... |
| 772,709 | ,, | 4 | 4 | Do. 4 p.c. 1st Red. Cum.Pref. | 13/—15/- | ... |
| 745,263 | June 17 | 4½ | 4½ | Do. 4½ p.c. 2nd Non.Cum. Pf. | 12/6—14/6 | ... |
| 1,200,000 | Sept. 9 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 82—87 | ... |
| 380,606 | Aug. 5 | 7 | 6⅔ | Uxbridge, &c., 5 p.c. ... ... | 80—90 | ... |
| 1,371,138 | July 8 | 3½ | 4 | Wandsworth Consolidated ... | 62—72 | ... |
| 2,525,768 | ,, | 4 | 4 | Do. 4 p.c. Pref. ... ... | 60—70 | ... |
| 1,343,964 | June 17 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 90—95 | ... |
| 383,745 | ,, | 4 | 4 | Do. 4 p.c. Deb. ... ... | 80—85 | ... |
| 558,342 | July 15 | 6 | 5 | Watford & St. Albans Ord. ... | 88—93 | ... |
| 300,000 | June 10 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 85—90 | ... |

## SUPPLEMENTARY LIST

| Issue. £ | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations Nov. 7. | Rise or Fall on week. |
|---|---|---|---|---|---|---|
| 351,685 | June 17 | 5 | 5 | Brighton, &c., 5 p.c. Perp. Deb. | 90—95 | ... |
| 28,700 | ,, 17 | 5½ | 5½ | Do. 5½ p.c. Red. Deb. 1942 ... | 96—101 | ... |
| 415,250 | ,, 17 | 4 | 4 | Bristol Gas Co., 4 p.c. New Deb. | 85—90 | ... |
| 140,205 | July 29 | 7 | 7 | Cambridge, &c., 7 p.c. Cons. 'B' | 100—110 | ... |
| 295,932 | Aug. 19 | 5 | 5 | Cheltenham, 5 p.c. Cons. Ord.... | 88—93 | ... |
| 42,500 | July 1 | 4 | 4 | Do. 4 p.c. Perp. Deb.... | 82—87 | ... |
| 150,000 | Aug. 12 | 4 | 4 | Croydon Gas, 4 p.c. Pref. (Irr.) | 70—75 | ... |
| 130,000 | July 1 | 4 | 4 | Do. 4 p.c. Deb. ... | 75—80 | ... |
| 146,700 | Aug. 19 | 5½ | 5½ | East Surrey, 5½ p.c. Pref. 'A' ... | 90—95 | ... |
| 53,220 | ,, 19 | 6 | 6 | Do. 6 p.c. Cum. Pref. ... | 95—100 | ... |
| 117,425 | Feb. 5 | 8 | 8 | East Wight, 5 p.c. Cons. Ord. ... | 100—110 | ... |
| ... | Aug. 19 | 6 | 4 | Eastbourne, 'B' 3½ p.c.... .. | 65—75 | ... |
| 239,135 | July 8 | 5 | 5 | Gas Consolidation 'A' Ord. (£1) | 13/6—15/6 | ... |
| 156,600 | Aug. 19 | 5 | 5 | Hampton C't, 5 p.c. Cons. Ord. | 68—73 | ... |
| 18,000 | June 10 | 7 | 7 | Malta & Med'n., 7 p.c. 1st Pref. | 60—65 | ... |
| 10,845 | ,, 10 | 7½ | 7½ | Do. 7½ p.c. 2nd Pref. | 60—65 | ... |
| 50,000 | Aug. 19 | £5 19 6 | £5 4 6 | Mid. South. Util., 'A' Cons. 5 p.c. | 63—73 | ... |
| 65,000 | Aug. 12 | 5 | 5 | North Middlesex, 5 p.c. Pref.... | 85—90 | ... |
| 70,000 | Sept. 9 | 5 | 5 | Plymouth & Stone., 5 p.c. Deb. | 87—92 | ... |
| 76,501 | July 1 | 4 | 4 | Reading, 4 p.c. Perp. Deb. ... | 75—80 | ... |
| 74,777 | Sept. 30 | 4 | 4 | Romford, 4 p.c. Debs. (Reg.) ... | 77—82 | ... |
| 21,000 | June 10 | 5 | 5 | Slough, 5 p.c. Perp. Deb. ... | 90—95 | ... |
| 211,740 | ,, 17 | 5 | 5 | Southampton, 5 p.c. Red. Deb. | 96—101 | .. |
| 363,575 | July 1 | 5 | 5 | Tottenham, 5 p.c. Reg. Red. Mt. | 95—100 | ... |
| 202,019 | Oct. 14 | 6½ | 6½ | Tunbridge Wells, 4 p.c. Scale ... | 70—80 | ... |
| 135,257 | June 10 | 5 | 5 | Uxbridge &c., 5 p.c. Perp. Deb. | 90—95 | ... |

## PROVINCIAL EXCHANGES

| | | | | | Quotations Nov. 1. | |
|---|---|---|---|---|---|---|
| 47,756 | July 26 | 6 | 5 | Bath Cons. ... ... ... | 95—100 | −3 |
| 122,577 | July 22 | 7 | 6 | Blyth 5 p.c. Ord. ... ... | 100—105 | ... |
| 1,667,250 | July 15 | 5 | 5 | Bristol, 5 p.c. max. ... ... | 87—90 | ... |
| 120,420 | June 17 | 4 | 4 | Do. 1st 4 p.c. Deb. ... ... | 94—96 | ... |
| 415,250 | ,, | 4 | 4 | Do. 2nd 4 p.c. Deb. ... | 92—95 | ... |
| 328,790 | ,, | 5 | 5 | Do. 5 p.c. Deb. ... ... | 108—111 | ... |
| 157,150 | Aug. 5 | 6½ | 5 | Chester 5 p.c. Ord. ... ... | 98—101 | ... |
| 92,500 | June 17 | 4 | 4 | Do. 4 p.c. Pref. ... ... | 80—85 | ... |
| 36,430 | ,, | 3½ | 3½ | Do. 3½ p.c. Deb. ... ... | 80—85 | ... |
| 41,890 | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 94—98 | ... |
| 542,270 | Aug. 12 | 9 | 6 | Derby Cons. ... ... ... | 100—105 | ... |
| 55,000 | June 10 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 96—102 | ... |
| 10,000 | Aug. 19 | 10 | 10 | Great Grimsby 'A' Ord. ... | 170—180 | ... |
| 6,500 | ,, | 10 | 10 | Do. 'B' Ord. ... | 170—180 | ... |
| 79,000 | ,, | 10 | 10 | Do. 'C' Ord. ... | 160—170 | ... |
| 732,000 | Aug. 26 | 4 | 4 | Hartlepool G. & W. Cn. & New | 63—68 | ... |
| 2,167,410 | Aug. 19 | 6 | 6 | Liverpool 5 p.c. Ord. ... ... | 94—96 | ... |
| 245,500 | June 17 | 5 | 5 | Do. 5 p.c. Red. Pref. ... | 97½—100½ | ... |
| 306,083 | July 15 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 99—101 | ... |
| 20,000 | June 24 | 5 | 5 | Long Eaton 5 p.c. Pref. ... ... | 9—11 | ... |
| 80,000 | June 24 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 100—105 | ... |
| 2,430,267 | July 29 | 5⅞ | 4 | Newcastle and Gateshead Con. | 15/6—16/6a | ... |
| 682,856 | ,, | 4 | 4 | Do. 4 p.c. Pref. ... ... | 74—76 | ... |
| 776,706 | Dec. 27 | 3½ | 3½ | Do. 3½ p.c. Deb. ... ... | 80—85 | ... |
| 277,285 | April 24 | 5 | 5 | Do. 5 p.c. Deb. '43 ... | 97—102 | ... |
| 274,000 | July 26 | 5 | 5 | Newport (Mon.) Ord. ... ... | 89—93 | ... |
| 13,200 | Sept. 16 | 8⅔ | 7 | Pontyp'l Gas & W. 10 p.c. 'A' | 11½—12½ | ... |
| 13,600 | ,, | 6 | 5 | Do. 7 p.c. 'B' ... ... | 9½—10½ | ... |
| 40,000 | ,, | 5 | 6 | Do. 7 p.c. 'C' ... ... | 9½—10½ | ... |
| 106,280 | Aug. 5 | 8 | 10 | Preston 'A' 10 p.c. ... ... | 157—167 | ... |
| 188,219 | ,, | 7 | 7 | Do. 'B' 7 p.c. ... ... | 113—123 | ... |
| 1,806,339 | Aug. 26 | 6½ | 6½ | Sheffield Cons. .. .. ... | 118—120 | ... |
| 95,000 | July 8 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 97— 99 | ... |
| 332,351 | Feb. 5 | 6 | 6 | Sunderland 6 p.c. max. ... | 107—112 | ... |
| 140,778 | Aug. 12 | 5 | 5 | Weston-super-Mare Cons. ... | 80—85 | ... |
| 64,338 | June 24 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 75—85 | ... |
| 33,340 | ,, | 7½ | 7½ | Do. 7½ p.c. Deb. ... ... | 137—145 | ... |

a.—The quotation is per £1 of Stock. * Ex. div. † Price free of income-tax.

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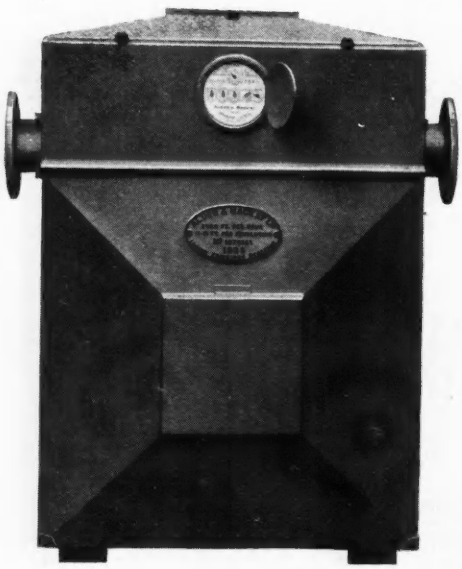

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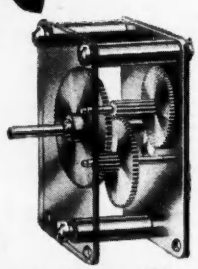

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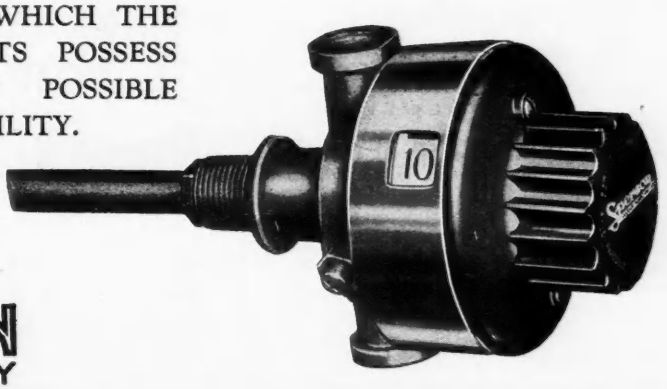


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